

DRAFT

Index Number CERCLA 02-2010-2017

OU2 SUPPLEMENTAL REMEDIAL INVESTIGATION WORKPLAN

**SHIELDALLOY METALLURGICAL SITE
NEWFIELD, NEW JERSEY**

TRC Job No. 112434ES

DRAFT
May 2011

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OU2 SUPPLEMENTAL REMEDIAL INVESTIGATION WORKPLAN

**SHIELDALLOY METALLURGICAL SITE
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1.0 INTRODUCTION

TRC Engineers, Inc. (TRC), has prepared this Operable Unit 2 (OU2) SUPPLEMENTAL REMEDIAL INVESTIGATION (RI) WORKPLAN for the Shieldalloy Metallurgical Site (SMC Site), located in Newfield, New Jersey (Figure 1). TRC and SMC executed the Administrative Order on Consent (AOC) for the Site with the U.S. Environmental Protection Agency (USEPA) on April 28, 2010. The AOC defined the following OUs:

- OU1-Non-Perchlorate Ground Water;
- OU2-Non-Perchlorate Soil, Sediment, and Surface Water; and
- OU3-Perchlorate, all media.

This OU2 SUPPLEMENTAL RI WORKPLAN satisfies Task I, Section F.2 of the AOC and Section III Task 1 of the AOC's Scope of Work. OU1 and OU3 requirements are addressed in other documents. The purpose of this OU2 SUPPLEMENTAL RI WORKPLAN is to provide the characterization of the nature and extent of OU2 and allow development of the Revised OU2 Risk Assessment and Feasibility Study.

The OU2 SUPPLEMENTAL RI WORKPLAN has been prepared in accordance with USEPA Region 2 Guidance for the Development of Quality Assurance Project Plans for Environmental Monitoring Projects (dated April 2004) and the most recent guidance in N.J.A.C. 7:26E Technical Requirements for Site Remediation and the New Jersey Department of Environmental Protection (NJDEP) Field Sampling Procedures Manual (2005). This OU2 SUPPLEMENTAL RI WORKPLAN is organized as follows:

- Section 1 presents introductory and background information;
- Section 2 summarizes the extensive available OU2 data and identifies data gaps;
- Section 3 outlines proposed supplemental OU2 RI activities;
- Section 4 discusses project organization and responsibilities;
- Section 5 assesses potential RI permit needs; and,
- Section 6 presents references.

This OU2 SUPPLEMENTAL RI WORKPLAN includes this document as well as the following companion documents:

- Quality Assurance/Quality Control Project Plan (QAPP);
- Health and Safety Plan (HASP);

- Memorandum on Exposure Scenarios and Assumption with the Revised Conceptual Site Model (CSM); and
- Revised Ecological Risk Report.

1.1 Site Location and Description

The Site is located at 35 South West Boulevard, primarily in the Borough of Newfield, Gloucester County, New Jersey. A small portion of the southwest corner of the site is located in the City of Vineland, Cumberland County, New Jersey. A site location map is provided on Figure 1. The SMC Facility comprises approximately 67.7 acres. The approximate center of the Facility is located at latitude 39°32'27.6"N, longitude 75°01'06.7"W. SMC also owns an additional 19.8 acres of farmland, referred to as the "Farm Parcel", located in Vineland, approximately 2,000 feet southwest of the facility. SMC purchased the Farm Parcel to facilitate the groundwater remediation, which includes a pumping well at this location. This Farm Parcel has never been used for manufacturing or related activities.

Specialty glass manufacturing began at the Site in the early 1900s. SMC manufactured specialty metals at the Site from 1955 to approximately 2007. The Site is currently used as office space and is sublet as warehousing and construction equipment storage space.

The Site is bordered as follows:

- To the north by a former rail spur and a former landfill;
- To the west by Conrail rail lines, West Boulevard, and various light industries and residences;
- To the east by a wooded area, residences and small businesses; and
- To the south by Hudson Branch stream, its associated wetlands/headwaters, and residences (located along Weymouth Road).

The Site is secured by a perimeter chain link fence. The facility parking lot along the western property boundary lies outside of the chain link fence to allow visitor and administrative access.

To understand the nature of the Facility, and to assist in the characterization, it is helpful to understand certain sections of the Site, defined by the facility's historic operations, current land cover, and potential future uses. The Site consists of six key areas, namely:

- Former Production Area,
- Former Lagoons Area,
- Eastern Storage Areas,
- Southern Area,
- Natural Resource Restoration Areas, and
- Restricted Area.

A description of the key areas is provided below. A plan depicting the boundaries of these areas and the physical features of the facility areas is provided as Figure 2.

1.1.1 Former Production Area

The Former Production Area is located in the northwest part of the Facility and is the area where the majority of former manufacturing activities occurred. The Former Production Area is approximately 22 acres, and is the largest key area.

The Former Production Area is largely covered with buildings and asphalt or concrete pavement. SMC uses one of the buildings as offices (D202). Current buildings used for storage include D117, D201, D203(D), and D203(E). Building D203(B) is used as a break room. Building D204 is a former scale house, and building D203(C) houses a plumbing backflow preventer. Vacant buildings include D110, D116(D), and D115. Building D203(F) is currently leased to the Borough of Newfield for storage of municipal vehicles. Building D203(A) is currently leased to a construction company (KB Construction). Building D116(A) is currently leased to the Borough of Newfield Public Works. TRC uses Building D216 for the Wastewater Treatment Facility component of the OU1 pump and treat system.

A Former Manpro-Vibra Degreasing Unit existed in the Former Production Area in former building D109; it was in periodic service for approximately 2 years (1965-1967). After 1967, the system's operation was discontinued and the entire system was removed from the Site. Trichloroethene (TCE) was the primary degreasing chemical used in the unit.

SMC's future plans for the Former Production Area include the continued use of the buildings for warehousing and construction equipment storage space (or replacement/repair thereof).

1.1.2 Former Lagoons Area

The Former Lagoons Area is located in the central portion of the Facility and occupies approximately 4.5 acres. The Former Lagoons Area includes closed lagoons that were used from the 1960s to the 1990s for wastewater treatment. During the 1960s, SMC used one unlined lagoon to hold untreated wastewaters at the location of former lined lagoons B-1, B-2, B-3, B-5, B-6, B-7, B-8, B-11 and B-12 (see Figure 2). In 1971, this one unlined lagoon was closed and replaced by nine smaller, lined lagoons (B-1, B-2, B-3, B-5, B-6, B-7, B-8, B-11 and B-12) in which the wastewater was treated. In 1987, the wastewater treatment process was modified with aboveground tanks replacing some of the lagoons in the wastewater treatment process. In May 1992, use of all nine lagoons was discontinued. The nine lagoons were characterized, remediated, and closed from 1994 to 1997. The closure activities were conducted in accordance with the Closure Plan-Surface Impoundments B-1, B-2, B-3, B-5, B-11 and B-12 (TRC, 1995) submitted to the NJDEP in August 1995 and Closure Plan-Surface Impoundments B-6-B-7, and B-8 that was submitted to the NJDEP in July 1997. NJDEP previously provided SMC with authorization to initiate the remedial action in a letter dated June 17, 1997.

Closure activities included sludge removal, liner removal, contaminated soil removal, post-excavation sampling, and backfilling. TRC prepared a Work Plan for the collection of supplemental soil samples in the area of the former lagoons which was submitted to the NJDEP on October 3, 2000. The Work Plan was approved on November 6, 2000. TRC performed and documented the prescribed sampling. Certain soil samples collected were below the water table (the saturated

portions are now considered part of the OU1 investigation and remediation). In a letter dated August 10, 2001, the NJDEP approved the lagoons closure report and concluded that limited residual hexavalent chromium concentration in soils do not appear to represent a continued source of groundwater contamination (NJDEP, 2001).

Two additional lined basins (B-9 and B-10) were located to the west of the former lagoons. These lined basins were used to contain wastewater associated with an air pollution control process. SMC stopped using the basins in early 1990s. In December 1992, the soils below the basins and the adjacent berm soils were sampled per NJDEP requirements. The analytical results indicated that past activities did not impact the surrounding soils. The lined basins were closed in 1993 and the berm soils were used to backfill the former basins.

Currently, the Former Lagoons Area is covered by light vegetation, which includes small trees and grass. SMC is considering a Brownfields/Brightfields approach for the Site, and is considering the Former Lagoons Area as the area to potentially receive a solar field. If viable, solar arrays would be placed in this area, after warranted remedial measures have been implemented.

1.1.3 Natural Resource Restoration Areas

Natural Resource Restoration Areas were constructed in 1999 and 2000 at designated portions of the facility to provide habitat value. These Natural Resource Restoration Areas were based on a Natural Resource Restoration Plan was prepared in October 1997 in accordance with the terms of USEPA and NJDEP Environmental Settlement Agreement (ESA), which was incorporated into SMC's plan of reorganization pursuant to Chapter 11 of the Bankruptcy Code (US Bankruptcy Court, 1997). In November 1997, the Office of Natural Resource Damage (ONRD) reviewed and approved the Natural Resource Restoration Plan.

The Natural Resource Restoration Areas cover totals approximately 9.65 acres, located in a non-contiguous collection of areas around the Facility, generally focused on the eastern and southern portions. These areas were established by importing soil (generally a minimum of 1' thick, but as much as 2' thick), then establishing vegetation. Vegetation includes a variety of grass, flowers, trees, and bushes. In addition to providing natural resource value, these areas were intended as a cap to address potential soil contamination at these locations.

To ensure the planted areas are maintained as vegetated areas, the future use of the planted areas is considered restricted. As such, the nature of these areas cannot be changed, without significant regulatory changes.

1.1.4 Eastern Storage Areas

The Eastern Storage Areas, which consist of two separate areas bounding the Restricted Area, are located to the east of the Former Production Area and Former Lagoons Area. These areas were previously used as the By-Product Drum Storage Area and a bone yard.

These areas have never included buildings or offices. Currently, the areas are covered with gravel, light vegetation and piles of concrete debris. Most of these areas were developed and included with the Natural Resource Restoration Tree Planting Area, which is discussed in Section 1.1.3.

SMC is considering this area for potential solar installation, or possibly continued use as storage.

1.1.5 Southern Area

The Southern Area is located along the southern property line of the Facility. The Southern Area includes undeveloped areas, the on-site impoundment, the Former Thermal Pond Area, and the Pansy Field. The on-site impoundment, as referenced in the current New Jersey Pollutant Discharge Elimination System (NJPDES) permit, receives a combination of facility stormwater and treated water from the on-site groundwater treatment system. The water from the on-site impoundment is directed into a ditch or unnamed tributary of the Hudson Branch. The on-site impoundment was installed in the early 2000s.

The Former Thermal Pond Area covers approximately 0.77 acres and consists of a rectangular depression area of approximately 3 feet deep. The Former Thermal Pond Area was used on a few occasions as an emergency holding reservoir for treated wastewater. The Former Thermal Pond Area is currently covered with vegetation (grass and small trees).

The Pansy Field covers an area of approximately 2.2 acres and was previously used by local farmers to grow pansies. The Former Pansy Field is included with the Natural Resource Restoration Tree Planting Area, which is discussed in Section 1.1.3. Based on historical aerial photographs, some areas in the Southern Area were used for miscellaneous storage.

Currently, the Southern Area is covered with vegetation that includes grass and small trees. Several areas were developed and included with the Natural Resource Restoration Tree Planting Area; these areas are shown on Figure 2. Wetlands also exist along the property line to the south.

Because of the nature of this area, its proximity to ditches and wetlands, and its non-contiguous nature, SMC is currently planning on no change for future site use.

1.1.6 Restricted Area

The Restricted Area is located in the eastern portion of the facility and is referred as a controlled area by the Nuclear Regulatory Commission (NRC). Due to the presence of naturally occurring thorium and uranium in the raw material used for ferro-columbium and the resulting slag and dust, this portion of the Facility is restricted.

A chain link fence with barbed wire surrounds this area (providing a second layer of security from the facilities perimeter fence). Additionally, the Restricted Area is posted with specific signage. Site personnel are trained to stay out of this area, unless specific training and/or escort is provided.

The Restricted Area is not the subject of the AOC and/or this OU2 SUPPLEMENTAL RI WORKPLAN.

1.2 Site History

Specialty glass manufacturing began at the Site in 1924. SMC purchased the Site in the early 1950s

and, from 1955 to approximately 2007, SMC manufactured specialty steel and super alloy additives, primary aluminum master alloys, metal carbides, powdered metals and optical surfacing products at the Site. Raw materials used at the Site included ores which contain oxides of columbium (niobium), vanadium, aluminum metal, titanium metal, strontium metal, zirconium metal, and fluoride (titanium and boron) salts.

SMC made various forms of vanadium in the 1980s and mid-1990s. Vanadium-related production generally occurred in Building D111. The raw material was in the form of an ash, and was transported to the Facility via a variety of containers (e.g., sacks, drums, truck loads). The raw material was stored in the 3-sided “pole building” east of Building D111.

1.3 Physical Setting

The referenced property is located within the Newfield, New Jersey 7.5' United States Geological Survey (USGS) Quadrangle (Figure 1).

1.3.1 Site Drainage and Surface Water

The topography of the Site is relatively flat. The Site is located on a slight topographic high, with the ground surface at the Site generally sloping to the west-southwest, toward the Hudson Branch stream.

Within the SMC Facility, drainage from developed portions of the Facility is managed via a storm drain system and through overland flow. Most of the drainage from the developed portion of the SMC Facility is directed to the on-site impoundment located in the southwestern portion of the Facility. The drainage from the employee parking lot area (west portion of the Site) is discharged into a ditch near the western boundary of the Facility. Stormwater drainage in the eastern undeveloped area of the Site is generally via sheet flow. In the restricted area, the surface runoff is controlled with berms located to the south and inside the fence.

Historically, the Site had three permitted discharge water outfalls to the Hudson Branch. Following the closure of on-site lagoon features and subsequent to the preparation of the Draft FS Report, the outfalls were revised to reflect current discharge conditions at the Site. Currently, there are two permitted outfalls (DSN004A and DSN001B).

DSN004A is located at the southwest corner of the on-site impoundment in the southwest portion of the SMC Facility. DSN004A receives a combination of facility stormwater and treated water from the on-site groundwater treatment system. When on-site operations were more extensive, non-contact cooling water was also discharged at this location. Flows from DSN004A are recorded at an H-flume located at the outfall.

DSN001B is located at the northwest corner of the on-site impoundment, and is the “tailpipe” of the pump and treat system. The treated groundwater pump and treat system discharge is monitored separately from the discharge at an internal monitoring point for the treatment system referred to within the NJPDES permit as DSN001B.

The most notable surface water body proximate to the Site is the Hudson Branch. The Hudson Branch originates just to the east of the Site and runs generally along the Facility's southern border. Based on numerous site inspections, the Hudson Branch (near the Facility) is relatively dry during most periods of the year. The upstream drainage area of the Hudson Branch is estimated at 1,180 acres (TRC, 2006). Runoff enters the Hudson Branch via overland flow and a number of culverts, including a north-south 36-inch diameter culvert that bisects the Site and conveys stormwater from areas of Newfield north of the Site to Hudson Branch. A broader area, approximately 1.4 acres in size, is located within this reach of the Hudson Branch, immediately south of SMC's former thermal cooling pond (see Figure 2). The channel of the Hudson Branch along the southern boundary of the Site varies in size; its width ranges from as little as a few feet at many locations to 100 feet wide at the broader area. The water depth in this portion of Hudson Branch ranges from zero feet (during dry periods) to approximately 3 feet deep.

Downstream of the SMC Facility, the Hudson Branch flows southwesterly, under South West Blvd. and Weymouth Road (via culverts) then through the Farm Parcel, discharging into Burnt Mill Pond, located approximately 6,500 feet southwest of the SMC Facility. Burnt Mill Pond has a surface area of approximately 15 acres in size and is impounded by a dam. Burnt Mill Pond is reported to be shallow, with a mean depth of 2.4 feet.

Burnt Mill Branch (sometimes referred to as the Manaway Branch) generally runs north to south and discharges into Burnt Mill Pond. Burnt Mill Branch is located approximately 4,000 feet west of the Site. The headwaters of Burnt Mill Branch begin approximately 7,000 feet northwest of the Site. The Burnt Mill Branch continues from Burnt Mill Pond, joining the Maurice River approximately 9,000 feet southwest of Burnt Mill Pond.

1.3.2 Wetlands

Wetlands were delineated along the Hudson Branch in the vicinity of the Site in 1994 by Schoor, DePalma & Canger Environmental Services, Inc., under contract to TRC (Schoor DePalma, 1994). The delineation covered an approximately 100-acre area, which included the Site and the Hudson Branch from the headwaters to the location of the RIW2 pumping center at the Farm Parcel. Multiple wetland habitats are present adjacent to the Hudson Branch including the following palustrine wetland types: emergent marsh, broad-leaved deciduous forest, scrub-shrub, and open water. The width of the wetlands ranges from approximately 5 feet (along the generally dry portion of Hudson Branch along the Facility boundary) to over 400 feet (near the southwest corner of the Facility). A wetland cover survey was conducted in 1996 by TRC and included the identification and subsequent field survey of the stream center line (thalweg) and limits of each wetland cover type (including the upland/wetland boundary) at 250-foot intervals along the Hudson Branch (TRC, 1996a).

1.3.3 Surficial Geology

Three surficial geologic units underlie the Site, which include the Bridgeton Formation, Cohansey Sand Formation, and the Kirkwood Formation. The Bridgeton Formation consists of up to 28 feet of brown sand and overlies the Cohansey Sand Formation which is comprised of coarse sands and little silt in the upper 40 feet with generally finer sand and some clay and silt lenses in the lower 60-80

feet. Discontinuous silt and clay up to 6 feet in thickness were encountered within the lower Cohansey Sand Formation. The Kirkwood Formation, predominantly a vertically confining gray clay and silt layer, was encountered between 121 to 153 feet below grade, underlying the Cohansey Sand Formation.

The thickness of the unsaturated soils at the Site ranges from a few feet (near the Hudson Branch) to 17 feet (in the northwest part of the Site). The surface soils and subsurface soils referred in this OU2 SUPPLEMENTAL RI WORKPLAN include the unsaturated soils (vadose zone). Saturated soils below the vadose zone are considered a component of OU1.

1.3.4 Bedrock Geology

Based on the average degree of dip for overburden in the Newfield area, it is estimated that the depth to bedrock beneath the Site to be approximately 2,000 feet below grade. Bedrock has not been encountered at the Site during previous investigations. Bedrock beneath the Site consists of banded, micaceous schists or gneiss within the Wissahickon Formation of Precambrian age. The Wissahickon Formation contains mica, quartz, feldspar, and chlorite with numerous fractures, joints, and folding of individual layers. The formation outcrops northwest of Gloucester County.

1.3.5 Local Hydrogeology

The principal aquifer in the vicinity of the Site is the Cohansey Sand, which is approximately 130 feet thick. The Cohansey Sand is underlain by the Kirkwood Formation. The upper portion of the Kirkwood Formation is composed of silt and clay, which functions as a confining unit in the vicinity of the Site, restricting the downward flow of groundwater from the Cohansey Sand. Depths to groundwater across the Site range from surface grade at the Hudson Branch to 17 feet below ground in the northwest quadrant of the Site. Based on extensive investigations, groundwater was identified at depths ranging from 4 feet to 31 feet. Seasonal fluctuations in the water table elevations are on the order of a few feet. Groundwater flow direction in the Cohansey Sand is southwest, which closely matches general Site topography. The average linear on-site groundwater flow velocity in the shallow portion of the aquifer is about 2.9 ft/day (TRC, 2008). A downward hydraulic gradient has been observed in most on-site well clusters, which is consistent with groundwater pumping conditions at and downgradient of the Site.

TRC operates a groundwater pump and treat system, which consists of an electrochemical precipitation and air stripper, to contain and treat chromium and TCE. Five extraction wells, two on-site in the southwest corner of the manufacturing portion of the Site (i.e., W9 and Layne), two “Car Wash” wells (RW6S, RW6D), and one well at the Farm Parcel (RIW2), withdraw groundwater. On-site groundwater movement in the lower Cohansey Sand is influenced by the treatment system’s pumping wells. Other anthropogenic factors including sewer systems and other buried utilities may also affect local groundwater movement.

Approximately 62 groundwater monitoring wells located on the subject Site and on adjacent properties and roadside right-of-ways (ROWs) are utilized for continuous groundwater monitoring.

1.4 Summary of Environmental Activities

Environmental investigations at the Site began in 1972, after the discovery of hexavalent chromium in a well that triggered studies to evaluate the potential environmental impacts associated with SMC's operations. Non-perchlorate groundwater (OU1) has been addressed by a pump and treatment system that has operated since 1979, and is still in operation.

Consequently, the Site has an extensive site characterization history of groundwater, soil, sediment and surface water sampling, as well as remedial activities. The Statement of Work for OU2 Supplemental RI and FS (Task 1, Section C) requires that all existing soil, surface water, and sediment data for the Site be reviewed to identify possible data gaps or areas where data may be require updating. Based on a review of the existing data, contaminants of concern (COCs) for OU2 include metals and certain volatile organic compounds (VOCs). A summary of previous soil, surface water, and sediment environmental investigations conducted at the Site are provided below. The results and potential data gaps are discussed in Section 2.0.

1.4.1 Soil

Surface and subsurface soil investigations were conducted between October 1990 and April 1991 to characterize the soils across the Site. The RI included the collection of 64 surface soil samples, 72 soil borings, and five test pits. The majority of the soil samples were analyzed for Target Analyte List (TAL) metals, boron, niobium, strontium, titanium, and hexavalent chromium. Selected samples were also analyzed for the Target Compound List (TCL) + 30 peaks and zirconium. The results of the RI were included in a Remedial Investigation Technical Report (TRC, 1992).

Characterization of soils was conducted at Former Lined Basins B9 and B10 in December 1992. Eight samples were collected beneath the liners and four samples were collected from the berm materials. The soil samples were analyzed for TAL metals and fluoride. Two samples from the basins were also analyzed for TCL VOCs plus boron, niobium, strontium, titanium and zirconium. The field activities and analytical results were included in a letter report (TRC, 1993).

A supplemental RI was conducted in August 1995 to delineate the extent of contamination observed during the 1991 RI. The supplemental RI included the collection of 40 surface soil samples and 52 subsurface soil samples. The samples were analyzed for those parameters that required delineation. The results of the supplemental RI were included with a Draft Final Feasibility Study Report (TRC, 1996a).

On April 11, 1996, representatives of NJDEP, SMC, and TRC collected a total of 22 samples along the Hudson Branch. Seventeen of the 22 samples were classified as soil samples since they were collected at distances between 20 to 80 feet from the stream center. Five of the 22 samples were classified as sediment samples since they were collected from the middle of the stream or within a broad area of diffuse water flow. Samples were collected beginning at a point downstream of existing sampling station SD-23 and continuing upstream to a point near existing sediment sampling station SD-17 (located between West Boulevard and Weymouth Road). The soil samples were collected from a depth of 0 to 0.5 feet and analyzed for total chromium, vanadium, nickel and copper

analysis. The results of the sampling were included in a letter report prepared by TRC and submitted to the NJDEP on May 3, 1996 (TRC, 1996b).

Lagoon closure activities were conducted at the Site from 1994 to 1997 and included characterization, remediation, and closure of nine wastewater treatment lagoons. Post-excavation soil samples were collected from the base and sidewalls of the lagoons. All samples were analyzed for TAL metals and hexavalent chromium. In addition, two samples per lagoon were analyzed for TCL VOCs boron, niobium, strontium, titanium and zirconium. The closure activities and analytical results were summarized in a Closure Report (TRC, 1999).

A supplemental soil sampling program was conducted in the Former Lagoons B6, B7, and B8 in November 2000. A total of 36 soil samples were collected from the base of the lagoons and analyzed for hexavalent chromium. The results of the investigation were provided in a Final Supplemental Soil Sampling Report, Former Lagoons B6, B7, and B8 (TRC, 2001a).

A supplemental soil sampling program was conducted in the Former Lagoons B1, B2, B3, B5, B11 and B12 in November 2000. A total of 26 soil samples were collected from the base of the lagoons and analyzed for hexavalent chromium. The results of the investigation were provided in a Final Supplemental Soil Sampling Report, Former Lagoons B1, B2, B3, B5, B11 and B12 (TRC, 2001b).

1.4.2 Surface Water

A total of five surface water samples were collected from the Hudson Branch in 1990 to determine the presence, nature and extent of surface water contamination. Three surface water samples were analyzed for TAL metals, hexavalent chromium, VOCs, sulfate, fluoride, and total cyanide. The remaining two samples were analyzed for TCL+30, TAL metals, hexavalent chromium, sulfate, cyanide, fluoride, boron, niobium, strontium, titanium, and zirconium. The results of the investigation were included in the Remedial Investigation Technical Report (TRC, 1992).

A total of seven surface water samples were collected within the Hudson Branch, Burnt Mill Pond, and Burnt Mill Branch during the supplemental investigation conducted in 1995. The surface water samples were analyzed for TAL metals, hexavalent chromium, and total hardness. The results of the supplemental surface water investigation were summarized in the Draft Final Feasibility Study Report (TRC, 1996a).

1.4.3 Sediment

A total of five stream sediment samples were collected from the Hudson Branch in 1990 to determine the presence, nature and extent of sediment contamination. Three sediment samples were analyzed for TAL metals, hexavalent chromium, VOCs, sulfate, fluoride, and total cyanide. The remaining two sediment samples were analyzed for TCL+30, TAL metals, hexavalent chromium, sulfate, cyanide, fluoride, boron, niobium, strontium, titanium, and zirconium. The results of the sediment investigation were included in the Remedial Investigation Technical Report (TRC, 1992).

In August 1995, a total of 27 stations were selected within the Hudson Branch, Burnt Mill Pond, and Burnt Mill Branch to delineate the extent of metal contamination in sediments and define

background conditions. The sediment samples were analyzed for TAL metals, hexavalent chromium, total organic carbon (TOC), grain size and pH. Selected sediment samples were also analyzed for TCL pesticides and polychlorinated biphenyls (PCBs). Following an initial review of the August 1995 supplemental sampling results, additional sediment characterization studies were conducted in September 1995. Eight sediment samples were collected for chemical, sediment bioassay and macrobenthic invertebrate bioassessment analyses. The sediment samples were analyzed for TAL inorganics, pH, total organic content, and acid volatile sulfide analysis. The sediment results were included in a Draft Final Feasibility Study Report (TRC, 1996a).

On April 11, 1996, representatives of NJDEP, SMC, and TRC collected a total of five sediment samples along the Hudson Branch. The sediment samples were collected from the middle of the stream or within a broad area of diffuse water flow between existing sampling station SD-23 and existing sediment sampling station SD-17 (located between West Boulevard and Weymouth Road). The sediment samples were collected from a depth of 0 to 0.5 feet and analyzed for total chromium, vanadium, nickel and copper analysis. The results of the supplemental sediment sampling were included in a letter report prepared by TRC and submitted to the NJDEP on May 3, 1996 (TRC, 1996b).

In March 2009, a total of 19 sediment samples were collected from 13 sampling stations where previous samples were obtained during the 1990 and 1995 sediment investigation to determine the current sediment quality. The sediment samples were analyzed for metals, pH, TOC, and grain size. Selected samples were analyzed for aquatic toxicity characteristics. The field activities and analytical results were summarized in a letter report (TRC, 2009).

1.5 Objectives

This OU2 SUPPLEMENTAL RI WORKPLAN has been developed to accomplish the objectives established in the AOC. TRC has also identified additional goals to meet its plan for the accelerated characterization and remediation of the Site. This OU2 SUPPLEMENTAL RI WORKPLAN has been designed to meet the following goals:

- Define the nature and extent of contamination in soil, sediment, and surface water;
- Develop a sufficient database to support the human health and ecological risk assessments;
- Address identified data gaps; and
- Collect sufficient data to support the revised FS.

1.6 Preliminary Identification of ARARs and TBC Information

As specified in the 1988 Guidance (USEPA, 1988), the preliminary identification of Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered information (TBCs) can assist in establishing preliminary remediation goals (PRGs), identifying preliminary remedial alternatives, and planning RI field activities. As the RI/FS progresses, ARARs and TBCs will continue to be identified and refined, based on a better understanding of site conditions and contaminants, risk pathways, receptors and remedial alternatives. In addition to federal ARARs,

more stringent state ARARs should be identified and other federal and state criteria, advisories, and guidance and local ordinances should be considered.

There are three general categories of ARARs. Contaminant-specific ARARs can define acceptable exposure levels and be used in establishing preliminary cleanup goals. Location-specific ARARs can set restrictions on activities in certain areas; a site-specific example is the set of wetlands regulations that will necessitate permits for removal and investigative activities, and will place restrictions on post-remedial land use scenarios. Action-specific ARARs can set controls for particular hazardous waste treatment and disposal activities.

The USEPA has developed regional screening levels (SLs) for chemical contaminants at Superfund Sites. It should be noted that the SLs are based upon human health risk and do not address potential ecological risk. USEPA's compilation of national recommended water quality criteria provide guidance for states and tribes to use in adopting water quality standards. USEPA has also developed Freshwater Sediment Screening Benchmarks (Region III BTAG, August 2006), which are values to be used for the evaluation of sampling data at Superfund sites.

The NJDEP has developed soil remediation standards that are used to establish cleanup goals under all NJDEP programs. The NJDEP has also developed criteria for sediment evaluation and surface water quality standards. Furthermore, the NJDEP has promulgated specific procedures for conducting the investigation and remediation of contaminated sites in the Technical Requirements for Site Remediation (TRSR) and has developed guidance for methodologies to be employed in field investigations in the Field Sampling Procedures Manual.

To determine the chemical-specific requirements which may be applicable to remediation at the Site, an evaluation of Federal and State chemical-specific ARARs/TBCs was conducted. Potential Federal and State chemical-specific ARARs and TBC criteria are presented in Table 1.

1.6.1 Potential Federal Chemical-Specific ARARs/TBCs

Chemical-specific ARARs/TBCs, which may be applicable to the development of PRGs for various media at the Site, are addressed by media below.

Soil

USEPA Regional SLs for Industrial Soil (May 2010) are used for site "screening" and as initial cleanup goals, if applicable. It should be noted that the SLs are based on human health risk and do not address potential ecological risk. SLs are not cleanup standards and should not be applied as such. The SL's role in site "screening" is to help identify areas, contaminants, and conditions that require further federal attention at a particular site. The SLs will be applicable to the soils, which are here referred as the unsaturated soils above the vadose zone.

Surface Water

USEPA's compilation of national recommended water quality criteria is presented as a summary table containing recommended water quality criteria for the protection of aquatic life and human health in surface water for approximately 150 pollutants. These criteria are published pursuant to

Section 304(a) of the Clean Water Act (CWA) and provide guidance for states and tribes to use in adopting water quality standards.

Sediment

USEPA Freshwater Sediment Screening Benchmarks (Region III BTAG, August 2006) were selected utilizing numerous criteria. The Region III BTAG Screening Benchmarks are values to be used for the evaluation of sampling data at Superfund sites. The tables include compounds for which benchmark values have been established or that are considered bioaccumulative compounds.

1.6.2 Potential State Chemical-Specific ARARs/TBCs

Soil

The NJDEP adopted new Remediation Standards rules at N.J.A.C. 7:26D. The soil remediation standards contained in those rules became effective on June 2, 2008. Soil Remediation Standards (SRS) have been developed by the NJDEP for use in establishing site-site specific goals. The SRS are not ARARs but are to be considered TBCs for soils. The NJDEP SRS for the ingestion/dermal exposure pathway are potential ARARs under CERCLA (except the standard for lead, and except when the future use of the site will be limited to recreation). Based on the future use of the Site (industrial), the NJDEP Non-Residential Direct Contact Soil Remediation Standard (NRDCSRS) will be considered with respect to soil quality. The remediation standards will be applicable to the soils, which are here referred as the unsaturated soils above the vadose zone.

Surface Water

The Surface Water Quality Standards (SWQS), N.J.A.C. 7:9B, establish the designated uses and antidegradation categories of the State's surface waters, classify surface waters based on those uses (i.e., stream classifications), and specify the water quality criteria and other policies and provisions necessary to attain those designated uses. Designated uses include drinking water supply, fish consumption, shellfish resources, propagation of fish and wildlife, recreation, and agricultural and industrial water supplies. The Hudson Branch is classified as FW2-NT (Category II classification). Therefore, the SWQC for FW2 waters identified in N.J.A.C. 7:9B are evaluated as ARARs for the Hudson Branch.

Sediment

The NJDEP Site Remediation Program (SRP), Environmental Toxicology and Risk Assessment (ETRA) Unit has developed Ecological Screening Criteria from various sources to allow ease of reference for ecological screening criteria (ESC) for sediment. The ESC are not promulgated standards, but are to be used as screening values in ecological assessments.

2.0 SUMMARY OF AVAILABLE OU2 DATA

SMC and TRC have implemented a series of investigative activities for OU2 from the 1990s to 2009. Extensive environmental data for different media have been collected throughout the years and analyzed for a broad spectrum of constituents. This body of data provides an excellent basis for OU2 characterization. A summary of previous environmental investigations conducted at the Site was also provided in Section 1.4. In summary, investigative activities included:

- Comprehensive Remedial Investigation/Feasibility Study (RI/FS) conducted between October 1990 and April 1991 and summarized in the Remedial Investigation Technical Report prepared in April 1992 (TRC, 1992).
- Supplemental sampling conducted in August and September 1995 summarized in a Draft Final Feasibility Study Report prepared in April 1996 (TRC, 1996a).
- Supplemental soil and sediment sampling conducted in April 1996 along Hudson Branch and summarized on a letter report prepared by TRC (TRC, 1996b).
- Sediment investigations conducted in March 2009 and summarized in a letter report prepared by TRC on June 22, 2009 (TRC, 2009).

TRC has reviewed the results of all previous sampling investigations, historical information and the recent investigation conducted at the Site to identify possible data gaps and collect data that need to be updated as required by The Statement of Work for OU2 Supplemental RI and FS (Task 1, Section C). The existing data for soil, surface water, and sediments, are discussed in the subsections below.

2.1 Soil Data

Numerous soil samples were collected across the Site during the RI conducted in October 1990 and the supplemental investigation conducted in August 1995 to characterize soil conditions and evaluate the extent of soil contaminants. Soil sampling was also conducted in the Former Lagoons Area to characterize the soils beneath the liners. Chemical analysis performed on the soil samples varied, depending on the location of samples within various plant process and storage areas. A summary of the previous soil investigations conducted at the Site was summarized in Section 1.4.1.

The analytical results for the soil samples collected during previous investigations were compared with the current USEPA Industrial SLs and the NJDEP NRDCSRs, which are considered TBCs for soil. The analytical results for VOCs, Semi-VOCs, and pesticides/PCBs are provided on Figures 3, 4, and 5, respectively. The results for metals, except hexavalent chromium and vanadium are provided on Figure 6. Because they are prominent contaminants of concern (COCs) at the Site, hexavalent chromium and vanadium are presented on separate figures. The analytical results for hexavalent chromium are provided on Figure 7. The analytical results for vanadium are provided on Figure 8. Numerous soil samples were also collected from the Former Lagoons Areas and analyzed for hexavalent chromium (Figure 9). Table 2 provides a summary of the number of soil samples collected by Facility area.

In addition to the soil samples collected from the Facility, TRC also collected soil samples near the Hudson Branch, southwest of the intersection of West Boulevard and Weymouth Road. The soil samples were collected at distances between 20 to 80 feet from the Hudson Branch. The analytical results for soil samples collected near the Hudson Branch are provided on Figure 10.

The discussion of the previous data is provided by Facility area and contaminant type in the following subsections.

2.1.1 Former Production Area

2.1.1.1 VOCs

A total of 34 soil samples were collected from within in the Former Production Area for analysis of VOCs. Some of the samples were collected from the former Manpro-Vibra Degreasing Unit, which is known to be the source of TCE groundwater contamination at the Site.

No VOCs were detected in the soil samples collected from the Former Production Area above the TBCs.

2.1.1.2 Semi-VOCs

A total of 28 soil samples were collected from the Former Production Area for semi-VOC analysis. No Semi-VOCs were detected in the samples above the TBCs.

2.1.1.3 Pesticides/PCBs

A total of 23 soil samples for pesticide/PCB analysis were collected from the Former Production Area. No pesticides/PCBs were detected in the samples exceeding the TBCs.

2.1.1.4 Metals

A total of 62 soil samples were collected from the Former Production Area for analysis of metals. All samples were analyzed for TAL metals and hexavalent chromium, except for 15 samples collected during the supplemental investigation in 1995 that were analyzed for at least one of the following compounds: arsenic, beryllium, chromium, hexavalent chromium and vanadium.

Vanadium was detected in 25 of 55 soil samples collected from the Former Production Area exceeding the USEPA Industrial SLs of 72 parts per million (ppm) and/or the NJDEP NRDCSRS of 1,100 ppm. Vanadium exceedances ranged from 76.7 ppm to 4,110 ppm. In general, the vanadium concentrations were observed to decrease with depth. Vanadium is slightly soluble in water and groundwater samples collected at the Site exhibited detectable concentrations of vanadium. A comparison of the most recent vanadium concentrations with those detected during the RI activities indicates a significant decrease of vanadium concentrations in groundwater.

Hexavalent chromium was only detected in three of 28 soil samples collected from the Former Production Area above the USEPA Industrial SLs of 5.6 ppm but below the NJDEP NRDCSRS of 20 ppm. The hexavalent chromium exceedances ranged from 8 ppm to 18.1 ppm.

Arsenic was only detected in two of 50 soil samples collected from the Former Production Area at concentrations exceeding the USEPA Industrial SLs of 1.6 ppm and NJDEP NRDCSRS of 19 ppm. Arsenic exceedances were reported at 43.1 ppm and 69.8 ppm, respectively. The sample with the highest concentration of arsenic (RA-64) was collected near the water table. Since only two samples were detected above the USEPA and NJDEP guidance, the arsenic exceedances are considered de minimus.

2.1.1.5 Data Summary

The primary chemical of potential concern (COPC) in the Former Production Area is vanadium, which exceeds the TBCs in almost half of the samples collected from this area.

Hexavalent chromium is a secondary COPC in the Former Production Area. The samples with hexavalent chromium exceedances were above the USEPA industrial SLs but below the NJDEP NRDCSRS.

2.1.1.6 Data Gaps

The existing soil data are sufficient to complete the Revised Risk Assessment. However, additional surface soils and subsurface soils will be collected at the Former Production Area to address data gaps.

For the Former Production Area and for purposes of horizontal delineation of surface soils, a data gap exists along the northern property line. Surface soil samples will be collected from this area to delineate vanadium exceedances and to consider remedial measures in the Feasibility Study.

A potential data gap also exists at the Former Manpro-Vibra Degreasing Unit where TCE was the primary degreasing compound used in the unit. Evidence of TCE contamination was not observed during previous soil investigations conducted in this area but existing groundwater data indicate that the highest TCE concentrations in the shallow zone have been detected in well SC-20, which is located in the proximity of the Former Manpro-Vibra Degreasing Unit. Several soil borings will be advanced in the area of well SC-20 to evaluate the subsurface soils conditions.

TRC, as part of the approved OU1 In Situ Expanded Pilot Program, will be performing certain ground water injections near well SC-20S, proximate to Former Building D109. Because TRC wants good data from the OU2 borings planned for this area, in the event that the OU1 ground water injections are performed prior to the proposed OU2 borings, TRC will wait to perform the OU2 borings until the OU1 effects are studied and understood.

A proposed sampling program to address the data gaps in this area is described in Section 3.4.1.1.

2.1.2 Former Lagoons Area

2.1.2.1 VOCs

A total of four soil samples were collected from the Former Lagoons Area for VOC analysis. No VOCs were detected in the samples above the TBCs.

2.1.2.2 Semi-VOCs

A total of two soil samples were collected from the Former Lagoons Area for Semi-VOC analysis. No Semi-VOCs were detected in the samples above the TBCs.

2.1.2.3 Pesticides/PCBs

A total of two soil samples were collected from the Former Lagoons Area for pesticide/PCB analysis. No pesticides/PCBs were detected in the samples above the TBCs.

2.1.2.4 Metals

A total of 30 soil samples were collected from the lagoons area for analysis of metals. No metals were detected in the samples above the TBCs, except for hexavalent chromium and vanadium.

Hexavalent chromium was detected in 18 of 78 soil samples collected from the lagoons at concentrations exceeding the USEPA Industrial SLs of 5.6 ppm and/or the NJDEP NRDCSRS of 20 ppm. The hexavalent chromium exceedances ranged from 5.6 ppm to 70 ppm. In a letter dated August 10, 2001, the NJDEP approved the lagoons closure report and concluded that the limited hexavalent chromium concentrations do not appear to represent a continued source of groundwater contamination (NJDEP, 2001). Ten of the 18 exceedances occurred below the water table. Exceedances below the water table will be addressed as part of OU1.

Vanadium was detected in seven of 21 soil samples collected from the lagoons at concentrations above the USEPA Industrial SLs of 72 ppm. The vanadium exceedances ranged from 91.2 ppm to 671 ppm. Vanadium was not detected above the NJDEP NRDCSRS of 1,100 ppm.

2.1.2.5 Data Summary

The primary COPCs identified in Former Basins B9 and B10 include vanadium and hexavalent chromium.

2.1.2.6 Data Gaps

Sufficient soil data exist at the Former Lagoons Area to complete the Revised Risk Assessment.

Investigation of surface and subsurface soils at Former Basins B9 and B10 was identified as a data gap. Since limited post-closure data are available for Former Basins B9 and B10, two soil borings are proposed to evaluate the surface and subsurface soil conditions in the former basins.

A proposed sampling program to address the data gaps in Former Basins B9 and B10 is described in Section 3.4.1.2.

2.1.3 Eastern Storage Areas

2.1.3.1 VOCs

A total of 13 soil samples were collected from the Eastern Storage Areas for VOC analysis. No VOCs were detected in the samples above the TBCs.

2.1.3.2 Semi-VOCs

A total of nine soil samples were collected from the Eastern Storage Areas for semi-VOC analysis. No Semi-VOCs were detected in the samples above the TBCs.

2.1.3.3 Pesticides/PCBs

Total PCBs were detected in one of 29 samples collected from the Eastern Storage Areas at a concentration of 2.5 ppm, which just exceeds the TBCs. Based on the distribution and number of PCB analysis conducted in this area, the PCB exceedances in one sample are considered de minimus. No pesticides were detected in the samples above the TBCs.

2.1.3.4 Metals

A total of 47 samples were collected from the storage areas for metal analysis. No metals were detected in the samples above the TBCs, except for vanadium and hexavalent chromium.

Vanadium was detected in 26 of 42 soil samples collected from the Eastern Storage Areas exceeding the USEPA Industrial SLs of 72 ppm and/or the NJDEP NRDCSRS of 1,100 ppm. Vanadium exceedances ranged from 82.9 ppm to 4,750 ppm.

Hexavalent chromium was detected in one of 42 soil samples collected just north of the Eastern Storage Areas exceeding the USEPA Industrial SLs of 5.6 ppm but below the NJDEP NRDCSRS of 20 ppm.

2.1.3.5 Data Summary

The primary COPC in the Eastern Storage Areas is vanadium and the secondary COPC in this area is hexavalent chromium.

2.1.3.6 Data Gaps

Delineation of surface soils to the north of the Eastern Storage Areas and near the property line was identified as a data gap. Three surface soil samples are proposed at locations near the property line

to delineate the vanadium and hexavalent chromium exceedances and to consider potential remedial measures in the Feasibility Study.

The available soil data at the Eastern Storage Areas are sufficient to complete the Revised Risk Assessment.

A proposed sampling program to address data gap is described in Section 3.4.1.3.

2.1.4 Southern Area

2.1.4.1 VOCs

A total of five soil samples were collected from the Southern Area and analyzed for VOCs. No VOCs were detected in the samples above the TBCs.

2.1.4.2 Semi-VOCs

A total of five soil samples were collected from the Southern Area and analyzed for Semi-VOCs. No Semi-VOCs were detected in the samples above the TBCs.

2.1.4.3 Pesticides/PCBs

A total of three soil samples were collected from the Southern Area and analyzed for pesticides/PCBs. No pesticides/PCBs were detected in the samples above the TBCs.

2.1.4.4 Metals

A total of 62 soil samples were collected from the Southern Area and analyzed for metals. No metals were detected in the samples above the TBCs, except for vanadium.

Vanadium was detected in 23 of the 62 samples exceeding the USEPA Industrial SLs of 72 ppm and/or the NJDEP NRDCSRS of 1,100 ppm. Vanadium exceedances ranged from 83.9 ppm to 12,100 ppm. Vanadium concentrations were observed to decrease with depth in this area.

2.1.4.5 Data Summary

Vanadium is the COPC identified in the Southern Area. The highest vanadium exceedances were detected near the southwest corner of the Site and south of the Former Lagoons Area.

2.1.4.6 Data Gaps

Data gaps identified in the Southern Area include the Former Thermal Pond Area, which was used in a few occasions as an emergency holding reservoir for treated wastewater. No previous soil investigations were conducted in this area. Six surface soil samples are proposed in this area to evaluate the surface soil conditions.

Delineation of surface soils in the southwest corner of the Site, along the property line, is also identified as a data gap. Two surface soil samples are proposed at locations near the property line to delineate the vanadium exceedances and to consider potential remedial measures in the Feasibility Study.

The existing data in this area are sufficient to complete the Revised Risk Assessment. A proposed sampling program to address these data gaps is described in Section 3.4.1.4.

2.1.5 Facility Wide Soil Data Summary

Hundreds of soil samples were collected across the Facility during previous investigations to characterize the soil conditions and delineate the extent of contaminants in the unsaturated zone. Soil samples were analyzed for a wide range of parameters that included VOCs, Semi-VOCs, pesticides/PCBs, TAL metals, and hexavalent chromium.

2.1.5.1 Facility Wide Results and COPCs

Vanadium was the primary COPC identified at the SMC Facility. Vanadium was detected in 95 of 201 soil samples collected across the Site at concentrations exceeding the USEPA Industrial SLs of 72 ppm and/or the NJDEP NRDCSRS of 1,100 ppm. Vanadium exceedances across the Site ranged from 75.8 ppm to 12,100 ppm. The highest vanadium concentrations were observed in the Eastern Storage Areas and the Southern Area. Vanadium, which has a low solubility, has also been detected in groundwater samples collected at the Site. A comparison of the most recent vanadium concentrations in groundwater (January 2010) with the results obtained during the initial RI activities (December 1990) indicates a significant decrease of vanadium concentrations in groundwater. Vanadium concentration maps for the shallow aquifer (January 2010 and December 1990 sampling events) were included in the OU1 Supplement RI Report that was submitted to the USEPA in January 2011.

Hexavalent chromium was identified as a secondary COPC across the Site. Hexavalent chromium was detected in 22 of 231 samples collected across the Site at concentrations above the USEPA Industrial SLs of 5.6 ppm and/or NJDEP NRDCSRS of 20 ppm. The exceedances of hexavalent chromium were detected in three samples from the Former Production Area, one sample collected off-site and north of the Eastern Storage Area, and 18 samples from the Former Lagoons Area.

2.1.5.2 Data Gaps

Sufficient soil data exist to complete a Revised Risk Assessment for all areas at the Site.

Based on the review and evaluation of the soil data and to consider potential remedial measures in the Feasibility Study, it is necessary to accomplish horizontal delineation of surface soils in several areas. Additional data will be obtained along the northern property line at the Former Production Area and the Eastern Storage Areas to delineate the horizontal extent of vanadium. Additional soil investigation will be conducted at the Former Manpro-Vibra Degreasing Unit, the Former Basins B9 and B10 and the Former Thermal Pond Area to evaluate the soil conditions in

these areas. Delineation of surface soils will also be conducted at the southwest corner of the Southern Area, near the property line.

Background soil data are also considered as a data gap. A total of 13 surface soil samples are proposed in areas around the Site to address data gaps and develop sufficient database to support the Revised Risk Assessment.

A proposed sampling program to address these data gaps is described in Section 3.4.1.5.

2.2 Surface Water Data

As discussed in Section 1.4.2, surface water samples were collected during the RI conducted in 1990 and supplemental investigations conducted in 1995.

The analytical results for surface water samples were compared with the National Recommended Water Quality Criteria (2009) and the NJDEP Surface Water Criteria (SWQC) for FW2-classified waters (2009), which were identified as the ARARs. The analytical results for surface water samples collected during previous investigations are provided on Figure 11. Table 3 provides a summary of the number of surface water samples collected by water body and type of analysis.

A discussion of the surface water results for each water body is provided below:

2.2.1 Hudson Branch

2.2.1.1 VOCs

Five surface water samples were collected from the Hudson Branch for VOC analysis. One of five surface water samples had a TCE concentration of 3 parts per billion (ppb), which exceeded the ARARs of 1 ppb. The TCE exceedance was detected in a surface water sample collected from the Farm Parcel, downgradient of the North Vineland Contamination area (the industrial area near the intersection of Weymouth Road and South West Boulevard), identified as contributing VOCs by the NJDEP (as discussed in the OU1 Supplemental RI Report, January, 2011). No TCE was detected in surface water samples collected in the vicinity of the Site. No other VOCs were detected in samples above the ARARs.

2.2.1.2 Semi-VOCs

Two surface water samples were collected from the Hudson Branch for Semi-VOC analysis. Bis (2-ethylhexyl) phthalate was detected at 2 ppb in one sample collected from the Farm Parcel. This concentration is above the ARARs of 0.3 ppb. Bis (2-ethylhexyl) phthalate is not considered a COPC since it is a common laboratory contaminant and it was present in the laboratory blanks. No other Semi-VOCs were detected in the samples.

2.2.1.3 Pesticides/PCBs

Two surface water samples were collected from the Hudson Branch for pesticide/PCB analysis. No

pesticides/PCBs were detected in the surface water samples above the ARARs.

2.2.1.4 Metals

Metals were detected in all surface water samples collected from the Hudson Branch at concentrations exceeding the ARARs. Metals exceeding the ARARs included: Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, iron, lead, mercury, nickel, vanadium, and zinc.

Vanadium was detected in all surface water samples collected from the Hudson Branch at concentrations exceeding the ARARs of 12 ppb. Vanadium exceedances ranged from 64.3 ppb to 5,700 ppb.

Chromium was detected in seven of eight surface water samples at concentrations exceeding the ARARs of 10 ppb. The chromium exceedances ranged from 43.3 ppb to 8,520 ppb.

Lead was detected in five of eight surface water samples at concentrations exceeding the ARARs of 2.5 ppb. Lead exceedances ranged from 2.9 ppb to 28 ppb.

Arsenic was detected in four of eight surface water samples at concentrations exceeding the ARARs of 0.017 ppb. Arsenic exceedances ranged from 2 ppb to 34.6 ppb.

Iron was detected in four of eight surface water samples at concentrations exceeding the ARARs of 1,000 ppb. Iron exceedances ranged from 1,210 ppb to 71,000 ppb.

Antimony was detected in two of eight surface water samples collected from the Hudson Branch at concentrations exceeding the ARARs of 5.6 ppb. Antimony exceedances ranged from 44.2 ppb to 151 ppb.

Zinc was detected in two of eight surface water samples at concentrations exceeding the ARARs of 120 ppb. Zinc exceedances ranged from 287 ppb to 1,070 ppb.

Barium (962 ppb), beryllium (25.1 ppb), cadmium (9 ppb), cobalt (62.2 ppb), mercury (21.4 ppb), and nickel (618 ppb) were only detected in one surface water sample at concentrations exceeding the ARARs.

The highest concentrations of metals were detected in surface water sample SW02, which was collected approximately 900 feet upstream of West Blvd. The metal concentrations in surface water samples were observed to decrease downstream of the Site.

2.2.1.5 Data Summary

The primary COPCs identified in the Hudson Branch are metals.

Secondary COPCs identified in the Hudson Branch included TCE that was detected at the Farm Parcel at a location downstream of other industrial facilities, near the intersection of Weymouth Road and South West Boulevard. No TCE was detected in the stream along the southern portion of

the Site.

2.2.1.6 Data Gaps

Because surface water conditions can considerably change over time, surface water samples are proposed along the Hudson Branch to evaluate the current water quality conditions and address data gaps. The surface water samples will be collected from same locations where sediment samples will be collected and include seven transects. The samples will be collected sequentially beginning at the most downstream location and ending with the upstream location to eliminate the potential for cross-contamination between sampling locations and to ensure sample quality. A discussion of the sediment data gaps is provided in Section 2.3.1.6.

A proposed sampling program to address the data gaps in the Hudson Branch is described in Section 3.5.1.1.

2.2.2 Burnt Mill Pond

2.2.2.1 VOCs

No surface water samples were collected from the Burnt Mill Pond for analysis of VOCs.

2.2.2.2 Semi-VOCs

No surface water samples were collected from the Burnt Mill Pond for analysis of Semi-VOCs.

2.2.2.3 Pesticides/PCBs

No surface water samples were collected from the Burnt Mill Pond for analysis of pesticides/PCBs.

2.2.2.4 Metals

Two surface water samples were collected from the Burnt Mill Pond for analysis of metals. Arsenic, chromium, and iron were detected in one surface water sample above the ARARs. Arsenic was detected at 2.8 ppb exceeding the ARAR of 0.017 ppb. Chromium was detected at 46.8 ppb exceeding the ARAR of 42 ppb. Iron was detected at 3,080 ppb exceeding the ARAR of 1,000 ppb. Lead and vanadium were detected in both samples above the ARARs. Lead was detected at concentrations ranging from 2.8 ppb to 3.4 ppb, which exceeded the ARAR of 2.5 ppb and vanadium was detected at concentrations ranging from 145 ppb to 413 ppb, which exceeded the ARAR of 12 ppb.

2.2.2.5 Data Summary

The primary COPCs in the Burnt Mill Pond surface water include arsenic, chromium, iron, lead, and vanadium.

2.2.2.6 Data Gaps

Surface water samples were collected from the Burnt Mill Pond in 1995 and no additional surface water data have been obtained from this pond. Because surface water conditions can considerably change over time, four surface water samples are proposed to be collected from the pond to evaluate current water quality conditions and address data gaps.

In order to determine whether any contaminants from the Burnt Mill Pond have migrated downstream into the Burnt Mill Branch, two surface water sample will be collected downstream of the pond.

A proposed sampling program to address the data gaps in the Burnt Mill Pond is described in Section 3.5.1.2.

2.2.3 Burnt Mill Branch

2.2.3.1 VOCs

No surface water samples were collected from the Burnt Mill Branch for analysis of VOCs.

2.2.3.2 Semi-VOCs

No surface water samples were collected from the Burnt Mill Branch for analysis of Semi-VOCs.

2.2.3.3 Pesticides/PCBs

No surface water samples were collected from the Burnt Mill Branch for analysis of pesticides/PCBs.

2.2.3.4 Metals

Two surface water samples were collected from the Burnt Mill Branch for analysis of metals. No metals were detected above the ARARs.

2.2.3.5 Data Summary

No COPCs were identified for the Burnt Mill Branch.

2.2.3.6 Data Gaps

Surface water samples were collected from the Burnt Mill Branch in 1995 (upstream of the Burnt Mill Pond). Because surface water conditions can considerably change over time and because there has only been sampling for metals in the Burnt Mill Branch, TRC considers the surface water data as a significant data gap. At least eight surface water samples are proposed to be collected from the Burnt Mill Branch (upstream of the pond) to address the data gaps.

The surface water samples will be collected sequentially beginning at the most downstream location and ending with the upstream location to eliminate the potential for cross-contamination between sampling locations and to ensure sample quality. At least one surface water sample is proposed from the Burnt Mill Branch (downstream of the Burnt Mill Pond) to determine if contaminants had migrated downstream.

A proposed sampling program for collection of background surface water samples from the Burnt Mill Branch is described in Section 3.5.1.3.

2.3 Sediment Data

As discussed in Section 1.4.3, stream sediments were sampled in 1990, 1995, and 2009.

The analytical results for sediment samples were compared with the USEPA Freshwater Sediment Screening Benchmarks (Region III BTAG, August 2006) and the NJDEP Ecological Screening Criteria (March 2009). The USEPA and the NJDEP screening levels are TBCs and should be used as screening values in ecological assessments. The analytical results for sediment samples collected during previous investigations are provided on Figure 12 (organics) and Figure 13 (metals). Table 4 provides a summary of the number of sediment samples collected by water body and type of analysis.

A discussion of the sediment results for each water body is provided below:

2.3.1 Hudson Branch

2.3.1.1 VOCs

Five sediment samples were collected from the Hudson Branch for VOC analysis. Methylene chloride was detected in one sample at 0.87 ppm, which exceeded the TBCs of 0.159 ppm. Carbon disulfide was detected in one sample at 0.004 ppm, which exceeded the TBCs of 0.000851 ppm. Methylene chloride is a common laboratory contaminant. No other VOCs were detected in the sediment samples.

2.3.1.2 Semi-VOCs

Two sediment samples were collected from the Hudson Branch for Semi-VOCs analysis. Phenol was detected in one sample at 0.52 ppm, which exceeded the TBCs of 0.0491 ppb. Benzoic acid was detected in two samples at 1 ppm and 3.2 ppm, respectively, which are above the TBC of 0.65 ppm. It should be noted that benzoic acid is no longer included in the TCL list and it will not be included in future sediment analyses. Bis (2-ethylhexyl) phthalate were detected in two sediment samples at 0.27 ppm and 0.58 ppm, respectively, which are above the TBCs of 0.18 ppm. Benzo(b)fluoranthene was detected in one sample at 0.11 ppm, which exceeded the TBC of 0.0272 ppm.

2.3.1.3 Pesticides/PCBs

Pesticides were detected in four of seven sediment samples at concentrations exceeding the TBCs. 4,4-DDE was detected at concentration ranging from 0.011 ppm to 0.046 ppm, which exceeded the TBC of 0.00316 ppm. 4,4-DDD was detected at concentrations ranging from 0.0053 ppm to 0.074 ppm, which exceeded the TBC of 0.00488 ppm. 4,4-DDT was detected at concentrations ranging from 0.014 ppm to 0.051 ppm, which exceeded the TBC of 0.00416 ppm. PCBs were detected in three of seven sediment samples at concentrations ranging from 0.095 ppm to 1.89 ppm, which exceeded the TBC of 0.0598 ppm.

2.3.1.4 Metals

A total of 54 sediment samples were collected from the Hudson Branch for metal analysis. Metals were detected in 53 of 54 sediment samples at concentrations above the TBCs. Metals with exceedances included: Aluminum, antimony, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc.

Chromium was detected in 53 of 54 sediment samples collected from the Hudson Branch at concentrations exceeding the TBC of 26 ppm. The chromium exceedances ranged from 30.1 ppm to 15,700 ppm. The highest chromium concentrations in the Hudson Branch were observed in sediment samples collected between the broader area (south of SMC) and the car wash area. Distribution of chromium along Hudson Branch during several sampling events is provided on Figure 14. The concentration of chromium in sediments generally decreases with distance from the Site.

Nickel was detected in 45 of 54 sediment samples exceeding the TBC of 16 ppm, at concentrations ranging from 17.8 ppm to 1,090 ppm. Lead was detected in 43 of 54 sediment samples exceeding the TBC of 31 ppm, ranging from 31.2 ppm to 381 ppm. Copper was detected in 41 of 54 sediment samples exceeding the TBC of 16 ppm, ranging from 17.4 ppm to 361 ppm. Mercury was detected in 34 of 54 sediment samples exceeding the TBC of 0.18 ppm, at concentrations ranging from 0.21 ppm to 8.3 ppm.

Other metals detected above the TBCs but at less frequency included aluminum, antimony, arsenic, cadmium, cobalt, iron, manganese, selenium, silver, and zinc.

The concentrations of metals at the downstream sampling stations generally decreased with distance from the Site. The concentrations of metals also decreased with depth as observed in those stations where additional samples were collected vertically for delineation purpose.

2.3.1.5 Data Summary

The primary COPCs for sediments in the Hudson Branch include metals.

The secondary COPCs for sediments in the Hudson Branch include Semi-VOCs and pesticides/PCBs.

2.3.1.6 Data Gaps

Sufficient sediment data exist to complete the Revised Risk Assessment for the Hudson Branch.

Sediment samples will be collected from the Hudson Branch to evaluate current sediment quality conditions and delineate the vertical extent of contamination. Sediment samples will be collected from transects located along the Hudson Branch. At each transect location, one surface water sample, at least one sediment sample, and two stream bank soil samples will be collected to address the data gaps.

The sediments in the on-site impoundment were also identified as data gaps. Six sediment samples will be collected from the on-site impoundment to evaluate the sediment quality conditions.

A sampling program that addresses the data gaps is described in Section 3.6.1.1.

2.3.2 Burnt Mill Pond

2.3.2.1 VOCs

No sediment samples were collected from the Burnt Mill Pond for analysis of VOCs.

2.3.2.2 Semi-VOCs

No sediment samples were collected from the Burnt Mill Pond for analysis of Semi-VOCs.

2.3.2.3 Pesticides/PCBs

No sediment samples were collected from the Burnt Mill Pond for analysis of pesticides/PCBs.

2.3.2.4 Metals

Nine sediment samples were collected from four stations at the Burnt Mill Pond and analyzed for metals. Metals exceeding the TBCs included antimony, cadmium, chromium, mercury, and nickel.

Chromium was detected in seven of nine sediment samples collected from the Burnt Mill Pond at concentrations ranging from 41.4 ppm to 594 ppm, which exceeded the TBC of 26 ppm.

Mercury was detected in two of nine sediment samples and antimony, cadmium, and nickel were detected in one nine sediment samples at very low concentrations and slightly exceeding the TBC.

2.3.2.5 Data Summary

The primary COPCs for sediments in the Burnt Mill Pond include chromium. The highest concentrations of chromium were detected at the station near the Hudson Branch discharge point. The secondary COPCs included antimony, cadmium, chromium, mercury, and nickel.

2.3.2.6 Data Gaps

Given the time elapsed since sediment samples were last collected from several stations at the Burnt Mill Pond, sediment sampling will be required from this area to assess current quality conditions and address data gaps. Sediment samples are also proposed at several locations in the pond to accomplish the vertical delineation.

A proposed sediment sampling program to address data gaps at the Burnt Mill Pond is provided in Section 3.6.1.2.

2.3.3 Burnt Mill Branch

2.3.3.1 VOCs

No sediment samples were collected from the Burnt Mill Branch for analysis of VOCs.

2.3.3.2 Semi-VOCs

No sediment samples were collected from the Burnt Mill Branch for analysis of Semi-VOCs.

2.3.3.3 Pesticides/PCBs

No sediment samples were collected from the Burnt Mill Branch for analysis of pesticides/PCBs.

2.3.3.4 Metals

A total of eight sediment samples were collected from four stations within the Burnt Mill Branch. Metals detected above the TBCs included cadmium, chromium, copper, lead mercury, and nickel.

Mercury was detected in six of eight sediment samples collected from the Burnt Mill Branch at concentrations ranging from 0.3 ppm to 1.5 ppm, which exceeded the TBC of 0.18 ppm. Lead was detected in four of eight sediment samples at concentrations ranging from 35.8 ppm to 91.9 ppm, which exceeded the TBC of 31 ppm. Chromium was detected in two of eight sediment samples at concentrations ranging from 38.3 ppm to 122 ppm, which exceeded the TBC of 26 ppm. Cadmium and nickel were detected in two of eight sediment samples and copper was detected in one of eight sediment samples at a low concentrations and slightly exceeding the TBCs.

2.3.3.5 Data Summary

Sediment samples were previously collected from the Burnt Mill Branch to evaluate background sediment conditions. The Burnt Mill Branch is located in a separate watershed basin relative to the watershed basin in which the SMC Facility is located. The primary COPCs for sediments in the Burnt Mill Branch include cadmium, chromium, copper, lead, mercury, and nickel.

2.3.3.6 Data Gaps

Given the time elapsed since sediment samples were last collected from the Burnt Mill Branch, sediment samples are proposed to be collected from this branch to assess current quality conditions. Background sediment samples are also proposed upstream of the Burnt Mill Pond to consider potential remedial measures in the Feasibility Study.

At least two sediment samples will be collected downstream of the Burnt Mill Pond to evaluate the sediment conditions, downstream of the Burnt Mill Pond.

A proposed sampling program to address the data gaps is described in Section 3.6.1.3.

3.0 SUPPLEMENTAL OU2 RI ACTIVITIES

The purpose of this OU2 SUPPLEMENTAL RI WORKPLAN is to provide guidance for all fieldwork by defining the sampling details and field data-gathering methods to be used during the RI. The sampling program defined in the OU2 SUPPLEMENTAL RI WORKPLAN is intended to address the data gaps discussed in Section 2 relative to the nature and extent of contamination at the Site, and to facilitate the risk assessment process and the feasibility study process.

All sampling, analysis, data assessment, and monitoring will be performed in accordance with USEPA Region 2 Guidance for the Development of Quality Assurance Project Plans for Environmental Monitoring Projects (dated April 2004) and any updates thereto, or an alternate EPA-approved test method and the guidelines set forth in the Settlement Agreement.

Each field activity will be conducted by field personnel wearing appropriate personal protective equipment (PPE) and using proper health and safety equipment as outlined in the HASP.

3.1 Supplemental OU2 RI Overview

The OU2 SUPPLEMENTAL RI WORKPLAN proposes a RI sampling program that is designed to be flexible and progressive in nature, to maximize the characterization of site conditions during the initial RI mobilization and reduce the need for subsequent RI phases. The OU2 SUPPLEMENTAL RI WORKPLAN is designed to fill the data gaps identified in Section 2.

The OU2 SUPPLEMENTAL RI WORKPLAN describes the sampling methodology for the characterization of the nature and extent of the contamination found in OU2, site soil, surface water, and sediment. The sampling methodology will involve the collection of multiple samples, with provisions for additional contingent samples, based on rapid evaluation of collected data. This approach will reduce the need for subsequent RI phases after submission of the RI Report.

As specified in Section III Task III-B of the AOC/SOW, SMC/TRC will notify EPA at least two weeks in advance of the field work regarding the planned dates for field activities. TRC will notify the EPA when field work is completed within 7 days of completion. TRC will submit the validated data to the EPA within 60 days of each sampling activity, as specified in Section III Task III of the AOC/SOW. Within 45 days of the submission to USEPA of the final set of validated data, TRC will submit a Site Characterization Summary Report for OU2 Supplemental RI activities, as specified in Section III Task III of the AOC/SOW. The results of initial sampling efforts will be evaluated as soon as data are available and if data gaps persist in one or more medium, additional sampling locations and depth intervals will be selected, depending on which data gaps exist after initial sampling. The project schedule is discussed in section 3.12.

3.2 Mobilization and Demobilization

This field investigation mobilization activity consists of field personnel orientation, equipment mobilization, the determination of sampling locations, and demobilization. Each field team member will attend an on-site orientation meeting to become familiar with the history of the Site, health and safety requirements, and field investigation procedures. Prior to initiating field activities, the State-

mandated underground utility location service will be notified to identify and mark underground utilities that may be serving the property.

Currently the Site is used as office space and is sublet as warehousing and construction equipment storage space. The Site is secured by a perimeter chain link fence and the facility parking lot along the western property boundary lies outside of the chain link fence to allow visitor and administrative access. A controlled area exists within the Facility and access will not be allowed to this area. The Restricted Area is located in the eastern portion of the Facility and it is referred as the controlled area by the NRC. Prior to scheduling the field work, TRC personnel will coordinate with the SMC representative to get access to the Site.

To reduce the accidental spread of contaminants by workers or equipment, work zones (Exclusion Zone, Contamination, and Support Zone) will be established using control lines or barriers for each subsurface investigation area prior to the implementation of field activities. The areas will be cordoned off to restrict unauthorized personnel. Additional information regarding the work zones and decontamination procedures is provided in Section 3.9.

Prior to the start of the field activities, all contractors and field personnel will become familiar with all facilities at the Site. A decontamination pad exists at the rear and west side of the treatment plant to decon vehicles and field equipment. Waste generated during the supplemental RI will be containerized and staged adjacent and south of the treatment plant to await characterization. Additional information regarding the waste management is provided in Section 3.11. A field trailer with central AC and heating is currently occupied by TRC personnel who operate the treatment system. The field trailer will be used to store field documents, logbooks equipment, sample containers, coolers, generators, and PPE. Field personnel will have access to telephone, computer, and water, which is available in the field trailer. Portable toilet facilities are also available at the treatment plant.

A copy of the HASP will be distributed to each field team member and subcontractor conducting field work at the Site. Prior to the implementation of field sampling activities, TRC will conduct the following activities at the Site in order to ensure the safe and efficient implementation of the Supplemental Work Plan in accordance with the OU2 SUPPLEMENTAL RI WORKPLAN:

- Verify the locations of existing subsurface utilities entering the Site through the New Jersey “One Call” system;
- Identify site ingress/egress points, Project Team meeting locations, work zone areas, equipment decontamination and storage areas, and drum storage areas (for cuttings, purge water and waste materials, as appropriate);
- Identify site security issues; and
- Locate and mark-out sampling locations.

For each site mobilization, the Field Team will manage and conduct the following tasks:

- Conduct daily tailgate meetings to discuss daily sampling work scope and health and safety issues;
- Verify that all team members and subcontractors have read and understand the HASP;

- Instruct all site personnel on procedures and hazards identified in the OU2 SUPPLEMENTAL RI WORKPLAN, QAPP and HASP.

Equipment and personnel will be demobilized at the completion of each phase of field activities as necessary. Demobilization will also consist of site-area clean-up and organization of investigation records.

3.3 Site Survey

The State Plane Coordinates will be obtained for all proposed sampling locations (soil, surface water, and sediment). Prior to conducting the field activities, the field team will identify the proposed locations using a GPS unit. Following the collection of the samples, a labeled stake will be placed in the ground to mark the sample locations.

All sample locations (soil, surface water, and sediment locations) will be horizontally located by a New Jersey-licensed land surveyor.

3.4 Soil Sampling

Soil samples will be collected from several areas at the Site to address data gaps. Information about the physical setting of the Site that includes site drainage, surface water, wetlands, geology, and hydrogeology is provided in Section 1.3. Section 2.0 provides a summary of the previous soil investigations and results for the soil samples collected from several areas at the Site.

3.4.1 Proposed Soil Sample Location and Frequency

Proposed soil sample locations from several areas at the Site are provided on Figure 15 and proposed background soil sample locations are provided on Figure 16. Table 5 provides a summary of the proposed sampling program and a protocol for collection of samples. Table 6 provides the media volume and preservation requirements for the specific analyses to be performed.

3.4.1.1 Former Production Area

The primary COPC identified in the Former Production Area is vanadium and the secondary COPC included hexavalent chromium. In order to delineate the horizontal extent of vanadium exceedances, four surface soil samples (SB-84 through SB-87) are proposed along the northern property. No horizontal delineation is being proposed for hexavalent chromium along the northern property line. Surface soil samples will be collected from exposed ground surface to 0.5 feet below ground. For the horizontal delineation sampling program, the analysis will be performed on an expedited turnaround (3 or 5 days) by a New Jersey-certified laboratory. If the surface soil sample results are above the EPA screening levels or NJDEP NRDCSRS, then, TRC and USEPA may determine if additional sampling will be required. The surface soil samples will be collected in accordance with the sampling procedures provided in Section 3.4.2.1.

A minimum of 5 soil borings (SB-88 through SB-92) will be advanced in the Former Manpro-Vibra Degreasing Unit, which is known to be the source of VOC contamination at the Site. Continuous soil samples will be collected to the water table and the sample with the highest photoionization

detector/flame ionization detector (PID/FID) reading or greatest impact (i.e., staining or sheens) will be submitted to the laboratory for VOC analysis on an expedited turnaround (3 or 5 days). When evidence of contamination is observed in a soil boring, then a contingency sample will be collected at a lower interval (2 to 3 feet below first sample) to accomplish the vertical delineation. If no evidence of contamination is encountered, a soil sample will be collected from the 0.5 feet interval above the water table and analysis will be performed on a normal turnaround time. If the results of the contingency sample exceed the EPA screening levels or the NJDEP NRDCSRS, then the field team will be directed to step out and advance a second boring to accomplish the delineation.

The actual number of samples will depend on field conditions and analytical results. Subsurface soil samples will be collected in accordance with the sampling procedures provided in Section 3.4.2.2.

3.4.1.2 Former Lagoons Area

Data gaps identified at the Former Lagoons Area include the collection of additional data from the Former Basins B9 and B10 to evaluate subsurface soil conditions. A soil boring will be advanced from the center of each former basin (Borings SB-93 and SB-94) and continuous soil samples will be collected to the top of the water table.

One surface soil sample will be collected from each boring for analysis of VOC, chromium, hexavalent chromium, vanadium, pH, and ORP on a normal turnaround time. The surface soil samples will be collected from surface to 0.5 feet below ground, except surface soil samples for VOC analysis that will be collected from 0.5 to 1 foot below ground. Surface soil samples will be collected in accordance with the sampling procedures provided in Section 3.4.2.1.

A subsurface soil sample will also be collected from each soil boring from the interval with the highest PID/FID reading or greatest impact (i.e., staining or sheens). The subsurface soil sample will be submitted to the laboratory for analysis of VOC, hexavalent chromium, vanadium, pH, and ORP on an expedited turnaround (3 or 5 days). When evidence of contamination is observed in a soil boring, then a contingency sample will be collected at a lower interval to accomplish the vertical delineation. If no evidence of contamination is observed, a soil sample will be collected from the 0.5 feet depth interval above the water table and analysis will be performed on a normal turnaround time by a New Jersey-certified laboratory.

Subsurface soil samples will be collected in accordance with the sampling procedures provided in Section 3.4.2.2.

3.4.1.3 Eastern Storage Areas

Surface soil samples (SB-95 through SB-97) are proposed off-site and north of Eastern Storage Areas to determine the horizontal extent of vanadium contamination. Sample SB-95 will also be analyzed for hexavalent chromium to delineate an exceedance near the property line. The surface soil samples will be collected from exposed ground surface to 0.5 feet below ground. For the horizontal delineation sampling program, the analysis will be performed on an expedited turnaround (3 or 5 days) by a New Jersey-certified laboratory. If the surface soil sample results are above the EPA screening levels or NJDEP NRDCSRS, then, TRC and USEPA may determine if additional

sampling is required.

The surface soil samples will be collected in accordance with the sampling procedures provided in Section 3.4.2.1.

3.4.1.4 Southern Area

Data gaps exist at the Former Thermal Pond Area and soil samples will be collected from this area to evaluate the surface soil conditions. Six surface soil samples (SB-98 through SB-103) will be collected for analysis of VOC, TAL metals, hexavalent chromium, pH, and ORP on a normal turnaround time. The surface soil samples will be collected from exposed ground surface to 0.5 feet below surface, except the samples for VOC analysis that will be collected from 0.5 to 1 foot below surface.

Surface soil samples (SB-104 and SB-105) are proposed along the southwestern property line to determine the horizontal extent of vanadium concentrations in this area. The surface soil samples will be collected from exposed ground surface to 0.5 feet below ground. For the horizontal delineation sampling program, the analysis will be performed on an expedited turnaround (3 or 5 days) by a New Jersey-certified laboratory. If the surface soil sample results are above the EPA screening levels or NJDEP NRDCSRS, then, TRC and USEPA may determine if additional sampling is required.

The surface soil samples will be collected in accordance with the sampling procedures provided in Section 3.4.2.1.

3.4.1.5 Background Soil Samples

A total of 13 surface soil samples (BG-1 through BG-13) are proposed to be collected from areas that are not influenced by releases (naturally occurring or anthropogenic). Naturally occurring is defined as those areas that are not influenced by human activity and anthropogenic is defined as natural and human made substances present in the environment as a result of human activities (not specifically related to the Site).

Background soil samples will be collected from exposed ground surface to 0.5 feet below ground. The surface soil samples will be collected in accordance with the sampling procedures provided in Section 3.4.2.1.

3.4.2 Soil Sampling Equipment and Procedures

Sampling will occur in progression from less contaminated areas to more contaminated areas. At each sample location, surface debris (e.g., leaves, vegetation, rocks) will be removed from the surface before sampling commences. In paved areas, the asphalt or concrete will be cored prior to advancing the sampling tools. If refusal is encountered during borehole advancement or insufficient volume is obtained, the field team will step out approximately 5 feet from the first borehole location to permit the collection of the samples from the desired intervals.

3.4.2.1 Surface Soil Sampling

Surface soil samples will be collected to accomplish the horizontal delineation of several metals along the property line and to evaluate surface soil conditions in other areas. Surface soil samples will be collected using decontaminated or dedicated sampling equipment (i.e., stainless steel spoons, hand augers, scoop or equivalent soil coring tool) from exposed ground surface to 0.5 ft below ground. Surface soil samples for VOC analysis will be collected from 0.5 to 1 foot below surface. After removing the sample from the ground, the soil will be homogenized in a dedicated stainless steel bowl. Then the samples will be transferred directly into the sample containers and the bottles will be capped and, if necessary, the outside of the bottle wiped with a clean paper towel to remove excess soil. The sample containers will be labeled and placed in a cooler on ice to await transport to a New Jersey-certified laboratory.

An EnCore sampler (one-time-use volumetric sampling and storage device) will be used to collect the sample for VOC analysis. During sample collection, the EnCore sampler will be removed from the re-sealable foil package and placed into the EnCore T-shaped handle. Prior to sample collection, the sampler must confirm that the plunger bottom is flush with the bottom of the coring body. The EnCore handle is then used to push the EnCore sampler directly into the soil matrix (of the selected 0.5 ft interval) and locked once the sample has been collected. The EnCore sampler will be removed from the handle and placed back into the foil package. The foil package will be labeled and placed in a cooler on ice for transport to a New Jersey-certified laboratory. The laboratory will extrude the soil sample from the EnCore® sampler and preserve it within 48 hours of sample collection. Following sample collection, the EnCore T-handle will be decontaminated for reuse at the next sample location.

For the horizontal delineation sampling program, the analysis will be performed on an expedited turnaround (3 or 5 days) by a New Jersey-certified laboratory, except the surface soil samples collected from the Former Basins B9 and B10 and the Former Thermal Pond Area where the analysis will be performed on a normal turnaround time. If the surface soil sample results are above the EPA screening levels or NJDEP NRDCSRS, then, TRC and USEPA may determine if additional sampling is required. Flow Diagram A-1 summarizes the sample collection protocol for surface soil sampling.

The soil will be classified using a modified Burmeister Classification System and soil logs will be prepared for each sampling location. Disposable gloves will be changed between each sample location and care will be taken to minimize contact of disposable gloves with soil to be sent for laboratory analysis. Following sample collection, the borings will be backfilled with soil removed during the sampling and the location of all soil borings will be staked and labeled.

For quality assurance purposes, field blanks (one per day) and duplicates (one per 20 soil samples) will also be collected for analysis for the same analytical parameters.

The aforementioned sampling procedure is summarized into the following step-by-step guidance:

1. Clear surface debris from the sampling location.

2. Collect a surface soil sample using decontaminated or dedicated sampling equipment (i.e stainless steel spoons, hand augers, split spoon sampler or equivalent soil coring tool) from exposed ground surface to the 0.5 ft below ground.
3. Remove soil sample from the ground. Once the soil is homogenized, the sample will be transferred directly into the sample containers.
4. Classify soil using a modified Burmeister Classification System. Lithologic descriptions should be recorded in the field logbook.
5. Complete sampling labels on each container and place the analytical samples in coolers for shipment and chill to 4°C.
6. Complete sample logs, custody seals, and chain of custody forms.
7. Soil sampling details should be recorded in a field logbook.
8. Return excess soil material to the borehole.
9. Stake and label the location of soil borings.
10. Initiate decontamination procedures of sampling equipment.

3.4.2.2 Subsurface Soil Sampling

Soil borings will be advanced at the Former Manpro-Vibra Degreasing Unit and the Former Basins B9 and B10 using a direct-push Geoprobe rig or hollow stem auger rig. Continuous soil samples will be collected from each boring from ground surface to the water table. Soil samples will be collected using decontaminated or dedicated sampling equipment (i.e., liners, split spoon sampler or equivalent soil coring tool).

Once the core sampler (containing the soil sample) has been withdrawn from the subsurface, the liner or split spoon will be placed on a table covered with plastic sheeting. Each soil core will be screened with a properly calibrated PID (MiniRAE 2000 or equivalent) or FID (Photovac MicroFID or equivalent). A decontaminated stainless steel spoon or knife will be used to make a longitudinal score deep along the length of the soil core to disturb the soil surface. The probe will be positioned immediately above the exposed, lateral scoring area to record PI/FID measurements in 0.5-foot intervals to determine the appropriate sample location. Based on the field screening with the PID/FID, the 0.5-foot depth interval of soil which displays the highest PID/FID readings (or other evidence of impact, such as staining or sheens) will be selected for laboratory analysis on an expedited turnaround (3 or 5 days). When evidence of contamination is observed in a soil boring, then a contingency sample will be collected at a lower interval (2 to 3 feet) to accomplish the vertical delineation. In the event that no PID/FID readings are detected above background, then a soil sample will be collected from the 0.5 foot depth interval above the water table and analysis will be performed on a normal turnaround time by a New Jersey-certified laboratory. If the results of the contingency sample exceed the EPA screening levels or the NJDEP NRDCSRS, then the field team

will be directed to step out and advance a second boring within 5 feet from the first one to accomplish the vertical delineation.

An EnCore sampler (one-time-use volumetric sampling and storage device) will be used to collect the sample for VOC analysis. During sample collection, the EnCore sampler will be removed from the re-sealable foil package and placed into the EnCore T-shaped handle. Prior to sample collection, the sampler must confirm that the plunger bottom is flush with the bottom of the coring body. The EnCore handle is then used to push the EnCore sampler directly into the soil matrix (of the selected 0.5 ft interval) and locked once the sample has been collected. The EnCore sampler will be removed from the handle and placed back into the foil package. The foil package will be labeled and placed in a cooler on ice for transport to a New Jersey-certified laboratory. The laboratory will extrude the soil sample from the EnCore® sampler and preserve it within 48 hours of sample collection. Following sample collection, the EnCore T-handle will be decontaminated for reuse at the next sample location.

Soil samples for other analysis will be homogenized and transferred directly into the sample containers. Once the sample has been transferred into the appropriate containers, the bottles will be capped and, if necessary, the outside of the bottle wiped with a clean paper towel to remove excess soil. The sample containers will be labeled and placed in a cooler on ice to await transport to a New Jersey-certified laboratory. Sample logs, custody seals, and chain of custody forms will be completed following the sampling activities.

Analysis of subsurface soil samples with evidence of contamination will be performed on an expedited turnaround by a New Jersey-certified laboratory. The expedited turnaround of sampling results will facilitate active decision making in the field to rapidly delineate the horizontal and vertical extent of site contamination (i.e., Triad approach). It is anticipated that the laboratory will analyze the soil samples and provide the results via e-mail (or facsimile) to the project manager (PM) and/or Field Team Manager within 3 to 5 days of sample collection. Based on these expedited results, the PM and/or Field Team Manager will also determine if additional horizontal and/or vertical delineation borings are necessary and direct the sampling team accordingly. Flow Diagram A-2 summarizes the sample collection protocol for subsurface soil samples.

Disposable gloves will be changed between each sample location. Care will be taken to minimize contact of disposable gloves with soil to be sent for laboratory analysis. Following sample collection, the borings will be backfilled with soil removed during the sampling and the location of all soil borings will be staked and labeled.

The soil will be classified using a modified Burmeister Classification System. Soil logs will be completed after sample collection to minimize losses due to volatilization and potential cross contamination due to excessive handling of the soil. All lithologic descriptions, PID readings, and soil sampling details for each boring location will be recorded in a field logbook.

For quality assurance purposes, field blanks (one per day) and duplicates (one per 20 soil samples) will also be collected for analysis for the same analytical parameters.

The aforementioned sampling procedure is summarized into the following step-by-step guidance:

1. Clear surface debris from the sampling location.
2. Collect continuous soil samples with liners, split spoon or coring device to the water table. Withdraw and carefully open liner or split spoon.
3. Score the soil with a knife longitudinally and screen the exposed soil with a PID/FID in 0.5-foot increments.
4. Sample the 0.5-foot zone displaying the highest PID/FID reading for VOC analysis using an EnCore[®] Sampler. If no PID/FID readings are observed, the sample should be collected from the 0.5-foot interval above the water table. PID/FID readings should be recorded in a field log book.
5. Prior to collecting sample, hold coring body of EnCore[®] Sampler, and push plunger rod down until small o-ring rests against tabs. This will assure that the plunger moves freely.
6. Depress locking level on EnCore[®] T-handle. Place coring body - plunger end first - into open end of T-handle, aligning the two slots on the coring body with the two locking pins in the T-handle. Twist coring body clockwise to lock pins in slots. Double check that sampler is locked in place prior to use.
7. To collect soil sample, turn T-handle such that "T" is up and coring body is down. This position plunger bottom flushes with the bottom of the coring body; double check that plunger bottom is in position.
8. Using T-handle, push EnCore[®] Sampler into soil until coring body is completely full. When full, the small o-ring will be centered in the T-handle viewing hole.
9. Remove sampler from soil. Wipe any excess soil from the exterior of the coring body.
10. Cap coring body while it is still on T-handle. Push cap over flat area of ridge. Push and twist cap to lock in place - cap must be seated over coring body ridges to seal sampler.
11. Remove capped EnCore[®] Sampler by depressing the locking lever on the T-handle while twisting and pulling sampler from T-handle.
12. Lock plunger by rotating extended plunger rod fully counter-clockwise until wings rest firmly against tabs.
13. Attach a completed label (provided with the EnCore[®] Sampler in the bag) to the cap on the coring body container. Place sampler in zipper bag provided, and seal bag.
14. Place initialed custody seal(s) over the top of the closed EnCore[®] bag, in such a manner that the bag cannot be opened (even partially); two or more custody seals may be needed.

15. Attach a completed sample tag to the bag, using tape or other method, provided that the sample tag is securely fastened to the bag and will not become dislodged in transit.
16. Collect an additional aliquot of soil from each sample location in a separate jar, for percent moisture determination by the laboratory.
17. Classify soil using a modified Burmeister Classification System. Lithologic descriptions should be recorded in the field logbook.
18. The remaining soil in the liner or split spoon from the target interval should be homogenized in a decontaminated, stainless steel bowl. Once the sample has been homogenized, the sample will be transferred directly into the sample containers.
19. Complete sampling labels on each container and place the analytical samples in coolers for shipment and chill to 4°C.
20. Complete sample logs, custody seals, and chain of custody forms.
21. Soil sampling details should be recorded in a field logbook.
22. Return excess soil material to the borehole and place wooden stake to mark the location.
23. Initiate decontamination procedures on sampling equipment.

3.5 Surface Water Sampling

Surface water samples were collected from Hudson Branch in 1990 and 1995 and from the Burnt Mill Pond and Burnt Mill Branch in 1995. Given the passage of time, current surface water quality conditions in the Hudson Branch, Burnt Mill Pond, and Burnt Mill Branch should be re-assessed to identify, verify and delineate potential environmental impacts that may be present in these water bodies.”

Surface water samples will also be collected to evaluate background conditions and to consider potential remedial measures in the Feasibility Study.

Surface water samples will be collected from the same station or transect location where sediment samples will be collected. At each location, the surface water sample will be collected first, followed by the collection of sediment samples. The samples will be collected sequentially beginning at the most downstream location and ending with the upstream location, to eliminate the potential for cross-contamination between sampling locations and ensure sample quality.

3.5.1 Proposed Surface Water Sample Location and Frequency

Locations of proposed surface water samples are provide on Figure 17. A summary of the proposed

surface water and sediment sampling is provided in Table 7. Table 6 provides the media volume and preservation requirements for the specific analyses to be performed.

3.5.1.1 Hudson Branch

A total of seven surface water samples will be collected from the center of the stream channel at transects located on the Hudson Branch, which coincide with previous stations SW/SD-01, SD-10, SD-13, SD-15, SD-18, SW/SD-04, and SD-23.

The surface water samples will be analyzed for TCL VOCs, TAL metals (total and dissolved), hexavalent chromium (total and dissolved), and hardness.

Surface water samples will be collected in accordance with the sampling procedures provided in Section 3.5.2.

3.5.1.2 Burnt Mill Pond

Four surface water samples are proposed at previous surface water samples SW-25 and SW-27 and at locations for previous sediment samples SD-26 and SD-29 to assess current surface water conditions in the pond. The surface water samples will be analyzed for TAL metals (total and dissolved), hexavalent chromium (total and dissolved) and hardness. If VOCs are detected in the Hudson Branch exceeding the EPA Water Quality Criteria or NJDEP screening criteria, then surface water samples will be collected from the Burnt Mill Pond for analysis of TCL VOCs.

Surface water samples will be collected in accordance with the sampling procedures and protocols provided in Section 3.5.2.

3.5.1.3 Burnt Mill Branch

Two surface water samples are proposed downstream of the Burnt Mill Pond. One surface water sample will be collected downstream of the Burnt Mill Pond at the location of previous sediment sample SD-28 and the second surface water sample (SW-38) will be collected approximately 500 feet downstream of previous sample SD-28. The surface water samples will be analyzed for TAL metals (total and dissolved), hexavalent chromium (total and dissolved), and hardness.

A total of eight surface water samples will be collected upstream of the Burnt Mill Pond to evaluate background surface water conditions. The surface water samples will be collected at previous surface water/sediment locations SW-30/SD-30 and SW-31/SD-31, intersection of Burnt Mill Branch and Columbia Ave. (SW-32), midpoint between Columbia Ave. and West Blvd. (SW-33), intersection of Burnt Mill Branch and West Blvd. (SW-34), previous sediment location SD-35, intersection of Burnt Mill Branch and Madison Ave. (SW-36), and at an upstream location near Route 40 (SW-37).

The surface water grab samples will be collected from the center of the stream channel and will be analyzed for TCL VOCs, TAL metals (total and dissolved), hexavalent chromium (total and dissolved), and hardness. Surface water samples will be collected in accordance with the sampling

procedures provided in Section 3.5.2.

3.5.2 Surface Water Sampling Equipment and Procedures

At each proposed sampling location, the sampler will attempt to identify a location within the surface water body where the stream flow is slow (e.g., pool, embayment) and would most likely represent a depositional area. At stations where surface water samples and sediment samples are proposed to be collected, the surface water will be collected first, followed by collection of the sediment samples. The samples will be collected sequentially beginning at the most downstream location and ending with the upstream location, to eliminate the potential for cross-contamination between sampling locations and ensure sample quality.

Surface water samples will be collocated spatially and temporally with sediment samples. The sampling device (open mouth container) will be fully submerged (beneath the air-water interface) and located directly above the sediment bed, pointing the open mouth of the container upstream. Once the sample has been collected, the liquid sample will be transferred directly into the pre-preserved sample bottle. The pre-preserved sample containers will be labeled and placed in a cooler on ice to await transport to a New Jersey certified laboratory.

Following the sample collection, water quality measurements (including temperature, pH, redox potential, turbidity, salinity, conductivity and dissolved oxygen) will be subsequently measured using field instrumentation (Horiba® water quality meter or equivalent). The sample location and field measurements will be recorded in a field logbook. A flow meter (Global water flow probe or other equivalent digital water velocity meter) will also be utilized to measure the stream flow within the mid-point of the stream channel.

Finally, the sample location will be photographed, flagged and the physical characteristics (width and depth, flow) of the stream sampling location will be recorded in the field logbook.

3.6 Sediment Sampling

The objective of the sediment sampling program will be to evaluate current conditions and delineate the extent of sediment contamination in the Hudson Branch and Burnt Mill Pond. Sediment samples will also be collected from the Burnt Mill Branch to assess background conditions. The samples will be collected sequentially beginning at the most downstream location and ending with the upstream location, to eliminate the potential for cross-contamination between sampling locations and ensure sample quality.

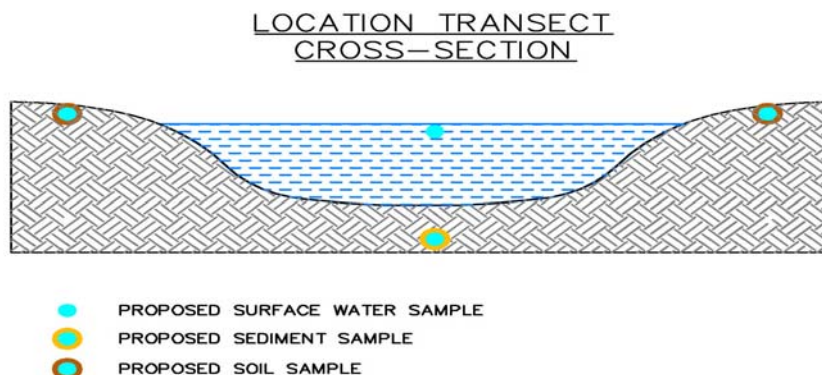
3.6.1. Proposed Sediment Sample Location and Frequency

Locations of proposed sediment samples are provided on Figure 17. Table 7 provides a summary of the proposed sediment sampling program. Table 6 provides the media volume and preservation requirements for the specific analyses to be performed.

3.6.1.1 Hudson Branch

Four transects will be located just south of the Site and three transects will be located downstream of the Site. Stream sediments and stream bank soil samples will be collected from seven transect lines that will be located perpendicular to the Hudson Branch. The transect lines will be located at previous stations SW/SD-01, SD-10, SD-13, SD-15, SD-18, SW/SD-04, and SD-23.

Each sampling location will be a transect, including one surface water sample, at least one sediment sample and two stream bank soil samples. A transect cross section for collection of surface water, sediment and soil samples is provided below.



At each sample point, a stream sediment sample will be collected from the depth interval of 1.5 to 2 feet to accomplish the vertical delineation. In addition to the stream sediment samples, soil samples will be collected from the base of each stream bank at a depth of 0 to 0.5 feet.

Six sediment samples (SD-IMP1A through SD-IMP6A) are also proposed to be collected from the on-site impoundment to evaluate the sediment conditions in this area. The sediment samples will be collected from the 0 to 0.5 ft interval below the water-sediment interface.

The sediment samples collected from the Hudson Branch and the sediment samples collected from the on-site impoundment will be analyzed for TCL Semi-VOCs, TCL Pesticides/PCBs, TAL metals, total organic carbon (TOC), particle grain size, and pH. The soil samples collected from the stream bank will be analyzed for TCL Semi-VOCs, TCL Pesticides/PCBs, TAL metals, hexavalent chromium, particle grain size, pH, and ORP. For the purpose to delineate chromium concentrations in the sediments in the Hudson Branch, total chromium in sediments will be compared with hexavalent chromium in stream bank soils.

Sediment samples will be collected in accordance with the sampling procedures provided in Section 3.6.2.

3.6.1.2 Burnt Mill Pond

Sediment sampling is proposed at previous sediment locations SD-25, SD-26, SD-27 and SD-29. At each location, sediment samples will be collected from the 1.5 to 2.0-foot depth interval to accomplish the vertical delineation. The sediment samples will be analyzed for TAL metals, TOC, particle grain size, and pH.

Sediment samples will be collected in accordance with the sampling procedures provided in Section

3.6.2.

3.6.1.3 Burnt Mill Branch

Two sediment samples are proposed downstream of the Burnt Mill Pond to evaluate sediment conditions in the Burnt Mill Branch. One sediment sample is proposed at previous sediment sample SD-28 and the second sediment sample (SD-38) is proposed approximately 500 feet downstream of SD-28. At these locations, sediment samples will be collected from the 0 to 0.5-foot depth interval to evaluate current sediment conditions. The sediment samples will be analyzed for TAL metals, TOC, particle grain size, and pH.

A total of eight sediment samples will be collected from the Burnt Mill Branch (upstream of the Burnt Mill Pond) to evaluate background conditions. At each location, sediment samples will be collected from the 0 to 0.5-foot depth interval beneath the sediment surface. Background sediment samples will coincide with the locations for background surface water samples. The sediment samples will be collected at previous surface water/sediment locations SW-30/SD-30 and SW-31/SD-31, intersection of Burnt Mill Branch and Columbia Ave. (SW/SD-32), midpoint between Columbia Ave. and West Blvd. (SW/SD-33), intersection of Burnt Mill Branch and West Blvd. (SW/SD-34), previous sediment location SD-35, intersection of Burnt Mill Branch and Madison Ave. (SW/SD-36), and at the upstream location near Route 40 (SW/SD-37).

The background sediment samples will be collected from the center of the stream channel and will be analyzed for TCL Semi-VOCs, TCL Pesticides/PCBs, TAL metals, TOC, particle grain size, and pH. The sediment samples will be collected in accordance with the sampling procedures provided in Section 3.6.2.

3.6.2 Sediment Sampling Equipment and Procedures

Prior to sample collection, a GPS unit will be used to relocate sediment sample locations. At stations where surface water samples and sediment samples are proposed to be collected, the surface water will be collected first, followed by collection of the sediment samples. The samples will be collected sequentially beginning at the most downstream location and ending with the upstream location, to eliminate the potential for cross-contamination between sampling locations and ensure sample quality.

The sediment samples will be retrieved using a decontaminated 4-inch diameter PVC pipe that will be driven into the sediment to a pre-determined depth based on the proposed depth(s) of sample collection. At a minimum, the pipe will be driven 0.5-foot deeper than the deepest sample interval. Prior to installation, the pre-determined depth will be marked on the outside of the PVC piping so as to provide a visual reference during installation. Note that this depth will be modified as necessary (e.g., increased) to account for standing water. Sediment samples will be collected within the pipe using decontaminated stainless steel hand augers or a sediment core sampler. The technique will allow for the collection of sediment samples with minimal collapse of the borehole, as the PVC pipe will impede the influx of water.

At locations for transects, stream bank samples will be collected from the 0.5-foot depth interval

below surface. The stream bank samples will be collected using decontaminated or dedicated sampling equipment (i.e., hand augers, scoops, core samplers or stainless steel spoons).

The contents from each auger, scoop, core sampler, or stainless steel spoon will be placed into a dedicated stainless steel mixing bowl and homogenized. The sediment samples will be geologically logged for grain size, color, texture, consistency, and other physical parameters (e.g., stains, odors, etc.) and the observations will be recorded in a field notebook. Once homogenized, the sample will be transferred into appropriate sample containers.

The field samplers will complete sample logs, labels, custody seals, and chain of custody forms and record all sampling details in the field logbook. The sediment sample locations are subject to field adjustment, based on site conditions and observations made at the time of sample collection. Decisions regarding final sample locations may be based on accessibility restrictions, discharge points, sediment depositional zones and other factors that may be encountered or observed during the field sampling.

The sediment sample locations will be photographed, flagged and the physical characteristics (width and depth, flow) of the stream sampling location will be recorded in the field logbook. It is anticipated that no wetland permits or other permits will be required to collect sediment samples from the stream since hand tools will be used to collect the sediment samples.

All analysis of sediment and stream bank samples will be performed on a normal turnaround by a New Jersey-certified laboratory. Flow Diagram A-3 summarizes the sample collection protocol for sediment/soil samples.

3.7 Sample Handling and Custody Requirements

The TRC Field Team Manager will coordinate with the laboratory for shipment and receipt of sample bottle, coolers, and Chain-of-Custody forms. Upon completion of sampling, the Chain-of-Custody will be filled out and returned with the samples to the laboratory. An important consideration for the collection of environmental data is the ability to demonstrate that the analytical samples have been obtained from predetermined locations and that they have reached the laboratory without alteration. Documentation will be accomplished through a Chain-of-Custody record that records each sample and the names of the individuals responsible for sample collection, transport, and receipt. A sample is considered in custody if it is:

- in a person's actual possession;
- in view after being in physical possession;
- securely sealed so that no one can tamper with it after having been in physical custody; or
- in a secured area, restricted to authorized personnel.

Sample custody will be initiated by field personnel upon collection of samples. Sample labels will be securely affixed to each sample container. Sample labels will clearly identify the particular sample, and delineate the following information:

- Site name and designated project number;

- Sampling location;
- Sample matrix (media type);
- Sample identification number (following the unique sample identification included on the media specific sampling summary tables);
- Date and time the sample was collected;
- Sample preservation method;
- Sample pH (if appropriate);
- Analytical method requested; and
- Laboratory turnaround (standard or expedited).

The samplers and Field Team Manager will, prior to shipment, physically inspect all sample bottles prepared for pickup or shipment. Samples will be packaged to prevent breakage or leakage during transport, and will be delivered to the laboratory by laboratory courier service or directly transported by TRC vehicle. The Field Team Manager will carefully review each Chain-of-Custody and compare it with the contents of the accompanying cooler to confirm the accuracy of the custody record. Each individual who has the sample in his or her possession will sign the Chain-of-Custody record.

The original Chain-of-Custody record will be sealed in a watertight envelope, taped to the top (inside) of the shipping container, and the shipping container sealed prior to being given to the transport technician or laboratory courier. A copy of the Chain-of-Custody record will be kept on-site. If shipping by commercial carrier, the waybill will serve as an extension of the Chain-of-Custody record between the final field custodian and receipt by the laboratory.

Upon receipt at the laboratory, a laboratory technician, or designated representative, shall open the shipping container(s), compare the contents with the Chain-of-Custody record, and sign and date the record. Any discrepancies shall be noted on the Chain-of-Custody record.

3.8 Reporting Requirements

A record of field observations and procedural methodologies will be kept in field logbooks throughout the duration of the dynamic field effort. The field team will review all field notes recorded each day for accuracy and completeness. Large site maps will be maintained in the field headquarters, and all sampling locations will be marked in the field and hand-plotted on these maps each day. Plotted data are to include GPS coordinates and photograph identification numbers. The spatial relationship of data will be tracked on the maps throughout the duration of the field program, thereby assisting the field team in making in-field decisions. For some parameters and sample sets, it is anticipated that the laboratory will provide the analytical results from the previous day of sampling via e-mail (or facsimile) to the Project Manager and/or Field Team Manager within 3 to 5 days of collection. Based on these expedited results, the Project Manager/Field Team Manager will determine if additional sampling is required and direct the sampling team accordingly. All directives given by the Project Manager/Field Team Manager and other field decisions related to the additional delineation sampling will be recorded in the field logbook (e.g., area to be further delineated, sampling rationale, new sampling identification numbers, and analytical parameters).

A representative of the project management team will be responsible for providing representatives of the regulatory agencies periodic project updates. At a minimum, such updates will occur when the field team believes that all field delineation efforts are about to be completed at any particular area, or in the event of an anticipated scope and/or schedule change. Representatives from the TRC project team will coordinate with USEPA representatives to meet at the field headquarters to review the findings of the dynamic field efforts prior to demobilizing from the Site. In this way, a consensus can be reached with respect to the adequate acquisition of all required field information.

3.9 Decontamination

Decontamination will be conducted in accordance with the USEPA's August 11, 1994 SOP No. 2006, "Sampling Equipment Decontamination" and the NJDEP Field Sampling Procedures Manual (2005). Proper decontamination is required for all personnel before leaving the site. A decontamination area shall be designated within the Contamination Reduction Zone prior to the implementation of field activities and shall be cordoned off to restrict unauthorized personnel. The decontamination will be accomplished through a systematic procedure of cleaning and removing PPE. Contaminants can adhere to the surface of PPE or permeate PPE material. It is important to avoid bodily contact with contaminated material, and to prevent contamination of the Support Zone.

All contaminated material that becomes attached to clothing or equipment must be removed and/or neutralized in either the Exclusion Zone or the Contamination Reduction Zone. PPE decontamination will include the following: washing of boots (or the removal and disposal of boot covers); washing, removal and disposal of disposable coveralls (or protective suits); removal and disposal of outer and inner gloves and finally, washing of hands, arms and face prior to leaving the site. Disposable PPE will be carefully removed and placed in plastic bags and sealed. When reusable personal protective equipment is worn, it must be decontaminated on site. After cleaning, the reusable protective equipment will be sealed in plastic bags for return shipment.

All non-disposable equipment involved in field sampling activities will be decontaminated prior to and after sampling. Equipment leaving the Site will also be decontaminated. Alconox and water wash will be used to remove all visible particulate matter and residual oils and grease. This may be preceded by using high pressure water or steam to facilitate residual removals. All heavy equipment (e.g., Geoprobe or other drilling equipment) will be steam cleaned prior to and after use. Pressurized steam will be used to remove all visible excess material from augers, rods, drill bits, the back of the drilling rig, and other parts of the rig which contact augers, rods, and split-spoons.

Field instrumentation (such as interface probes, water quality meters, etc.) will be decontaminated between sample locations by rinsing with deionized water. If visible contamination still exists on the equipment after the rinse, an Alconox detergent scrub will be added, and the probe thoroughly rinsed again.

All sampling equipment will be properly decontaminated prior to entering the field and before advancing to each new sample location. The field sampling equipment cleaning and decontamination procedures are as follows:

- Laboratory grade glassware detergent plus tap water wash
- Generous tap water rinse

- Distilled and deionized (ASTM Type II) water rinse
- 10% nitric acid rinse (trace metal or higher grade HNO₃ diluted with distilled and deionized [ASTM Type II] H₂O)
- Distilled and deionized (ASTM Type II) water rinse
- Acetone (pesticide grade) rinse (if sample is analyzed for organics)
- Total air dry
- Distilled and deionized (ASTM Type II) water rinse.

All decontaminated sampling equipment will be subsequently wrapped and/or sealed in plastic (or foil) during storage and prior to use. The decontamination process will be carried out over an open drum. All decontamination wastes will be properly disposed at an approved disposal facility. The field team will document each decontamination event (time, date, equipment) in the field logbook.

3.10 Field Equipment Calibration

All field equipment will be calibrated in accordance with the manufacturer's instructions (using specific reference materials and test procedures) prior to the initiation of each field sampling. Any equipment which provides unusual responses or questionable results should be re-calibrated to perform satisfactorily. If extreme vapor concentrations are measured during field screening, the equipment should be re-calibrated to ensure proper field measurements. Any equipment that has been shown to be defective, should be deactivated, labeled and stored at a specified place until it can be repaired. The sampling team will record the daily field equipment calibration activities in the field logbook with a clear description of equipment type, manufacturer name and identification number, calibration test performed and results, time and date.

3.11 Investigation-Derived Waste

Investigation derived waste (IDW) residuals will be containerized and sampled to make a hazardous waste determination. Following generation, the IDW will be containerized and staged adjacent and south of the treatment plan to await characterization. Based on the sampling results and consultation with the EPA Remedial Project Manager, a subsequent determination shall be made whether IDW can be placed on-site.

Personnel directly involved in equipment decontamination will wear appropriate protective clothing, as stated in the HASP. Used PPE and any gross solids removed from the equipment during the physical removal process shall be stored in a drum. The soap and water liquid wastes will also be stored in an appropriate drum or container. The diluted acid rinsate will be stored in an appropriate container or neutralized with a base and then placed in an appropriate drum. The solvent rinse wastewater shall be placed into an appropriate container or drum. The final rinse wastewater shall be emptied onto the ground.

All waste handling will be conducted in accordance with all applicable federal and state regulations. The containers used to store IDW will be new USDOT-approved drums classified as 1A1/Y 340/S (r equivalent lined with a 6-millimeter liner). The drums will be labeled with the generation date, unique drum number and a TRC I.D. sticker. The drums will be staged in a designated area and will be disposed of by TRC.

3.12 Schedule

A project schedule for the performance of the supplemental RI/FS activities is provided on Figure 18. The Site Characterization (Task 3) component on Figure 18 refers to the field program covered by this OU2 SUPPLEMENTAL RI WORKPLAN. This draft schedule is subject to change pending regulatory approvals and contractor availability.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project team will include the following personnel:

- TRC PROJECT COORDINATOR will be the main TRC contact for the project and will be responsible for ensuring that the project is being implemented in accordance with the USEPA approved work plans and the OU2 SUPPLEMENTAL RI WORKPLAN. The TRC Project Coordinator is responsible for ensuring that these practices, policies, objectives and procedures are communicated to, and understood, implemented, and adhered to by all personnel. The TRC Project Coordinator, also designated as the Project Coordinator under the Order, will be the focal point for contact with the USEPA Project Coordinator and other regulatory personnel and will be directly supported by the TRC Project Manager, Field Team Manager, the TRC Quality Assurance (QA) Manager, and where appropriate, the Laboratory Manager and/or the Laboratory QA Manager. Patrick Hansen has been approved by the USEPA as the Project Coordinator for the Shieldalloy Metallurgical Site RI.
- TRC PROJECT MANAGER will ensure that all the technical, administrative, and regulatory compliance objectives are met on a day-to-day basis. The TRC Project Manager will regularly interface with the Project Coordinator and the Field Team Manager. The TRC Project Manager will serve as a secondary liaison to USEPA and other regulatory personnel, in support of the TRC Project Coordinator, and attend all regulatory meetings. The TRC Project Manager will be responsible for the successful completion of the project (in terms of budget, schedule, data quality objectives), coordinating with technical task leaders, interpreting site data, and providing input into the development and finalization of key technical deliverables. Jorge Gomez will serve as the TRC Project Manager for this project.
- TRC QA MANAGER will ensure that all elements of the QAPP are followed. Where QA or Quality Control (QC) issues arise, the TRC QA Manager will be contacted by the Project Manager, Field Team Manager or Laboratory QA Manager, depending on the nature of the issue, for guidance and resolution. The TRC QA Manager will report directly to the TRC Project Coordinator and shall remain independent from all data generators and users. Elizabeth Denly will serve as the TRC QA Manager for this project.
- TRC FIELD TEAM MANAGER will be responsible for overseeing field activities on a day-to-day basis. The TRC Field Team Manager will ensure that all field work is conducted in accordance with the approved work plans and this OU2 SUPPLEMENTAL RI WORKPLAN. Should potential issues arise, the TRC Field Team Manager will contact the TRC Project Manager, TRC QA Manager, Laboratory QA Manager or TRC Project Coordinator, as appropriate.
- TRC SITE SAFETY OFFICER will be responsible for ensuring all field activities are being implemented in accordance with the Health & Safety Plan and when necessary, evaluating new hazards and operation changes. The Site Safety Officer has the authority to correct all noncompliance situations immediately and to stop work in cases of immediate danger.

- TRC ENVIRONMENTAL SCIENTISTS/GEOLOGISTS will be responsible for performing field activities in accordance with the approved workplans and this OU2 SUPPLEMENTAL RI WORKPLAN on a day-to-day basis. Should potential issues arise, these technical specialists will contact the TRC Field Team Manager or TRC Project Manager, as appropriate.
- LABORATORY MANAGER will be responsible for ensuring that the laboratory follows the laboratory QAPP and all laboratory standard operating procedures (SOPs). In addition, the Laboratory Manager will sign off on all of the data packages to further document that all Laboratory quality assurance program and SOP procedures have been followed and that the data are legally defensible. The Laboratory Manager is responsible for administering the operations of the Environmental Laboratory in accordance with N.J.A.C. 7:18, 40 CFR 136, and any other applicable regulations. This includes the reporting of tests and analyses and personal or telephone consultation with Environmental Laboratory staff and the USEPA, when necessary. If the manager is to be absent, the manager shall arrange for a substitute. The Laboratory Manager is also responsible for signing reports of analytical data and for assuring that all laboratory personnel meet the applicable requirements of N.J.A.C. 7:18-2:10(b) for their classification. If the manager assigns a designee to sign reports, the laboratory shall inform the USEPA of the designee's name and authority to sign reports.
- LABORATORY QUALITY ASSURANCE (QA) MANAGER is responsible for the day-to-day oversight and review of all QA/QC and for overall technical operation and stewardship of the Environmental Laboratory and will be required to ensure that laboratory staff follows the Laboratory QA Manual (QAM) and SOP requirements. The Laboratory QA Manager is responsible for ensuring that all requirements of N.J.A.C. 7:18, 40 CFR Part 136 and any other applicable regulations are met. As such, the QA Manager shall monitor the performance of technical personnel performing the analyses of all parameters. He or she shall oversee the performance and result reporting of all laboratory procedures, tests, analyses, and quality assurance (for which he or she is qualified) to determine and assure compliance with applicable regulations. The QA Manager shall implement and be responsible for the Laboratory's Quality System, per N.J.A.C. 7:18-5.5 and 8.4, and ensure that the QA policies/objectives and the QC procedures outlined in the laboratory's Quality System manual (Appendix A for HCL, Appendix B for Paradigm Laboratory and Appendix C for TRC), in laboratory's NJDEP Sanctioned Analytical Methods (DSAM), and in N.J.A.C. 7:18 are followed. The QA Manager shall objectively evaluate laboratory data and shall review and approve all reported compliance results. In the event that the Laboratory QA Manager is absent, he or she must designate a substitute to perform the above duties. The substitute must meet the requirements and qualifications for Laboratory QA Manager outlined in N.J.A.C. 7:18-2.10. The Laboratory QA Manager shall conduct internal audits, notify the Laboratory Manager of deficiencies found, and identify and monitor corrective action. Where technical project QA/QC issues arise, the Laboratory QA Manager must advise the Laboratory Manager, TRC QA Manager and/or the TRC Field Manager as appropriate.
- LABORATORY TECHNICIANS are responsible for performing all analyses in accordance with approved analytical methods to help control process variables and to determine

compliance with the QAPP.

- DRILLING SUBCONTRACTOR is responsible for drilling permits, licenses, clearances, and supplying all services (including labor), equipment, and material required to perform soil borings, in addition to all maintenance and quality control of such equipment. The drilling subcontractor will be responsible for following decontamination and health and safety procedures specified in the OU2 SUPPLEMENTAL RI WORKPLAN, HASP and in the bid package. Upon completion of the work, the drilling subcontractor will be responsible for demobilizing all equipment and properly backfilling any borings.
- SURVEYING SUBCONTRACTOR is responsible for supplying all services (including labor), equipment, and material required to perform surveys of the Site and sampling locations.

5.0 PERMIT IDENTIFICATION AND PERMIT APPLICATIONS

TRC has reviewed the applicability of the following list of Federal, State and local permits or permit modifications or certifications. TRC has concluded that none of these permits are required for the OU2 Supplemental RI.

Permit	Applicable
1. Soil Erosion and Sediment Control Plan Certification for Land Disturbance Control (N.J.A.C. 2:90)	No
2. Permit to Construct/Install/Alter Air Quality Control Apparatus/Equipment (N.J.A.C. 7:27-8)	No
3. Certificate to Operate Air Quality Control Apparatus/Equipment (N.J.A.C. 7:27-8)	No
4. Wetlands Permit (N.J.S.A. 13:9A-1 et seq.)	No
5. Freshwater Wetlands/Open Water Fill Permit (N.J.S.A. 13:98-1 et seq.)	No
6. Flood Hazard Area Control Act Permits (N.J.S.A. 58:16A-50 et seq.; N.J.A.C. 7:13)	No
7. State Water Quality Certificate (N.J.S.A. 58:10A-1 to 13; 33 U.S.C. 1251, § 401)	No
8. Dewatering Permit and/or Water Diversion Permit (N.J.S.A. 23:5-29)	No
9. U.S. Army Corps of Engineers Dredge and Fill Permit	No
10. Discharge Prevention and Discharge Cleanup and Removal Plans (Pertaining to Storage and Transfer of Petroleum and other Hazardous Substances) (N.J.S.A. 58:10-23.11 et seq.; N.J.A.C. 7:1E)	No
11. Registration of Underground Storage Tank; UST Installation Permit and Closure Approval (N.J.S.A. 58:10A-21 et seq.)	No
12. Water Quality Management Plan Consistency Determination (N.J.S.A. 58:11A-1 et seq.; N.J.A.C. 7:15)	No
13. New Jersey Pollutant Discharge Elimination System (NJPDES) (N.J.S.A. 58:10A-1 et seq.; N.J.A.C. 7:14A) i. NJPDES--Discharge to Surface Water (DSW)--Industrial (N.J.S.A. 58:10A-1 et seq.; N.J.A.C. 7:14A); ii. NJPDES--Significant Indirect User (SIU) (N.J.S.A. 58:10A-1 et seq.; N.J.A.C. 7:14A); and iii. NJPDES--Discharge to Ground Water (DGW) (N.J.S.A. 58:10A-1 et seq.; N.J.A.C. 7:14A and N.J.A.C. 7:26E-7.2);	No
14. Treatment Works Approval (TWA) (N.J.S.A. 58:12A-1 et seq.; N.J.A.C. 7:14A-22 and 23)	No
15. Employer License (Asbestos) (N.J.A.C. 8:60-4), (N.J.A.C. 12:120-4)	No
16. Asbestos Worker or Asbestos Supervisor Permit Certification of Training Agencies (Asbestos) Asbestos Work Notification Requirements (N.J.A.C. 8:60-6), (N.J.A.C. 12:120-6)	No

17. National Emission Standards for Hazardous Air Pollutants (NESHAPs) Written Notification Requirements;	No
18. Landfill Disruption/Closure Approval (N.J.S.A. 13:1E-1 et seq.; N.J.A.C. 7:26-2A.8; N.J.A.C. 7:26-2A.9)	No
19. Hazardous Waste Facility Registration (N.J.S.A. 13:1E-1 et seq.; N.J.A.C. 7:26G)	No
20. Short Term Water Use Report	No
21. Well Drilling Permit, and Well Certification Forms A & B; (N.J.S.A. 58:4A-14; N.J.A.C. 7:9D)	No
22. Well Abandonment Form;	No
23. Exemption of Waste Flow Rule (Soil Reuse);	No
24. Hazardous Waste Generator Identification Number (N.J.A.C. 7:26G);	No
25. Hazardous Waste TSD Facility Permit, except that hazardous waste treatment, storage, or disposal facility permits pursuant to the Solid Waste Management Act, N.J.S.A. NOTE: THIS IS A COURTESY COPY OF THIS RULE. ALL OF THE DEPARTMENT'S RULES ARE COMPILED IN TITLE 7 OF THE NEW JERSEY ADMINISTRATIVE CODE. 141 13:1E-1 et seq., and the Hazardous Waste rules at N.J.A.C. 7:26G, shall not be required for any remediation conducted on site pursuant to the Administrative Requirements for the Remediation of Contaminated Sites rules, N.J.A.C. 7:26C; and	No
26. Any other Federal, State or local approvals that may be required.	No

6.0 REFERENCES

N.J.A.C. 7:26E - Technical Requirements for Site Remediation (2010)

NJDEP Field Sampling Procedures Manual (2005)

NJDEP, 2001. Basin Closure, NJDEP letter, August 10, 2001.

Schoor DePalma, 1994. Environmental Report, Wetlands and State Open Waters Delineation, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, Schoor DePalma, May 1994.

TRC, 1992. Remedial Investigation Technical Report, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, April 1992.

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TRC, 1995. Closure Plan-Surface Impoundments B-1, B-2, B-3, B-5, B-11 and B-12, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, August 1995.

TRC, 1996a. Draft Final Feasibility Study Report, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, April 1996.

TRC, 1996b. Supplemental Wetland Sediment Sampling Letter Report, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, May 1996.

TRC, 1999. Lagoon Closure Report, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, December 1999.

TRC, 2000. Supplemental Soil Sampling Report, Former Lagoon B11, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, October 2000.

TRC, 2001a. Final Supplemental Soil Sampling Report, Former Lagoons B6, B7 and B8, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, February 2001.

TRC, 2001b. Final Supplemental Soil Sampling Report, Former Lagoons B1, B2, B3, B5, B11 and B12, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, February 2001.

TRC, 2006. 2006 Sediment Sampling Work Plan, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, August 2006.

TRC, 2008. Phase II Supplemental Offsite Ground Water Investigation Work Plan, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, August 2008.

TRC, 2009. Supplemental Sediment Sampling Summary, Shieldalloy Metallurgical Corporation, Newfield, New Jersey, TRC Environmental Corporation, June 2009.

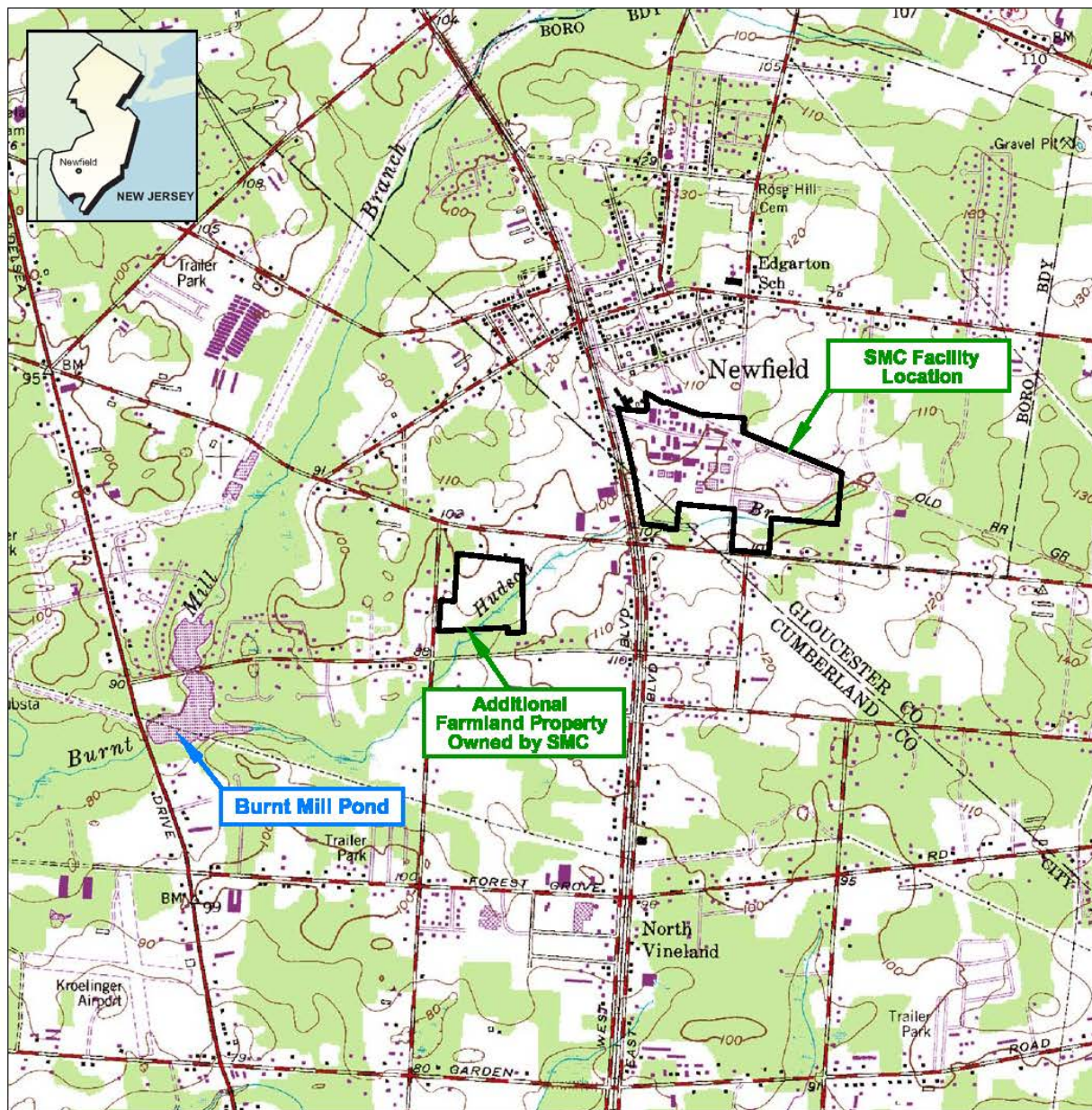
USEPA - SOP No. 2006, "Sampling Equipment Decontamination" (August 11, 1994)

USEPA, 1988 – Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Office of Emergency and Remedial Response, USEPA, Washington, DC.

USEPA Region 2 Guidance for the Development of Quality Assurance Project Plans for Environmental Monitoring Projects, April 12, 2004.

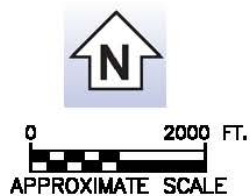
US Bankruptcy Court, 1997. Environmental Settlement Agreement (ESA) between SMC and USEPA/NJDEP. Incorporated into SMC's Plan of Reorganization Pursuant to Chapter 11 of the Bankruptcy Code, March 1997.

FIGURES



SOURCE: NEWFIELD, N.J. QUADRANGLE, 1953, PHOTOREVISED 1994,
7.5 MINUTE SERIES (USGS TOPOGRAPHIC MAP)

— SITE PROPERTY BOUNDARY



TRC ENVIRONMENTAL CORP.
57 East Willow Street
Millburn, New Jersey 07041

SITE LOCATION MAP

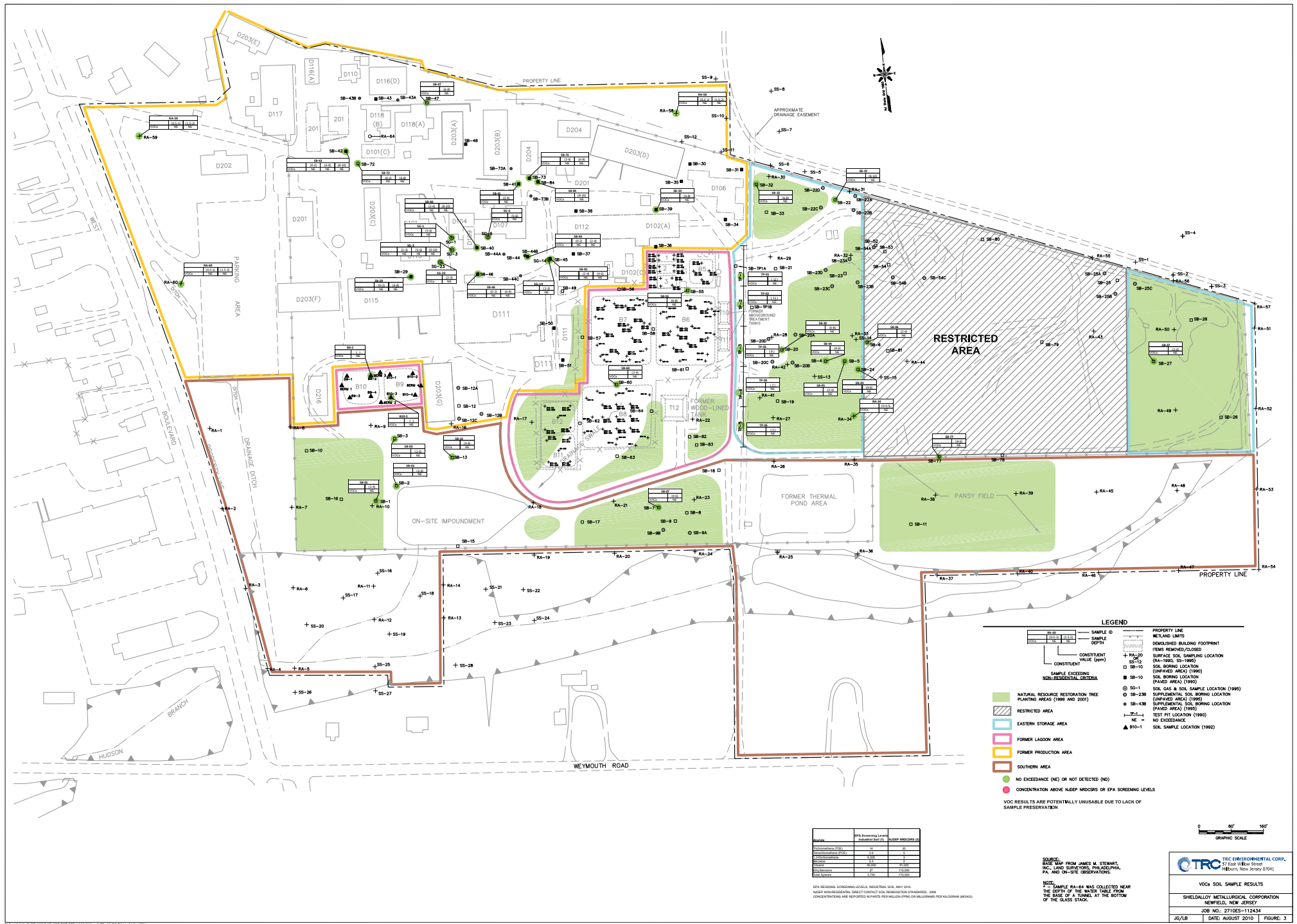
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

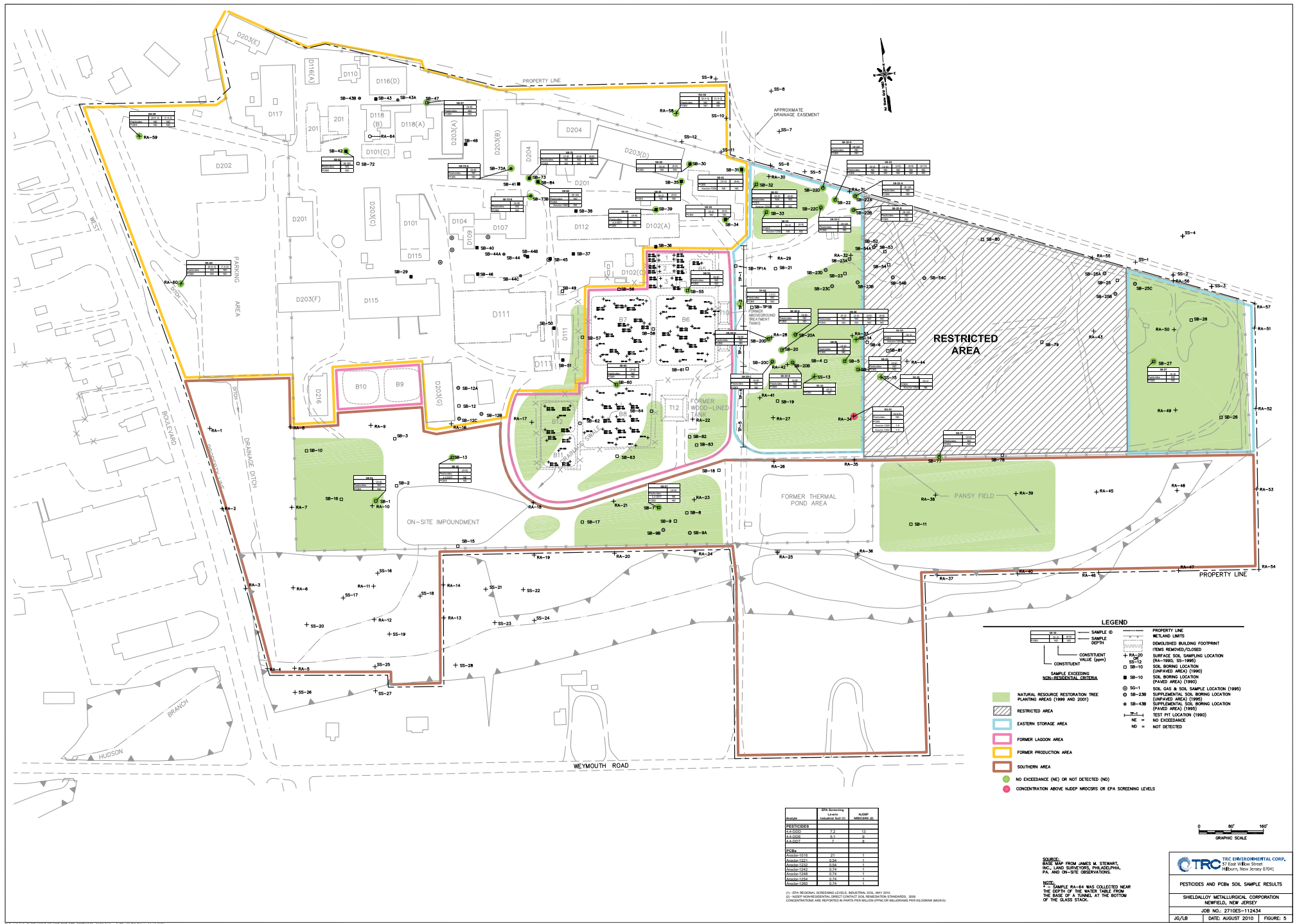
JOB NO.: 2710ES-112434-00SOIL-002500

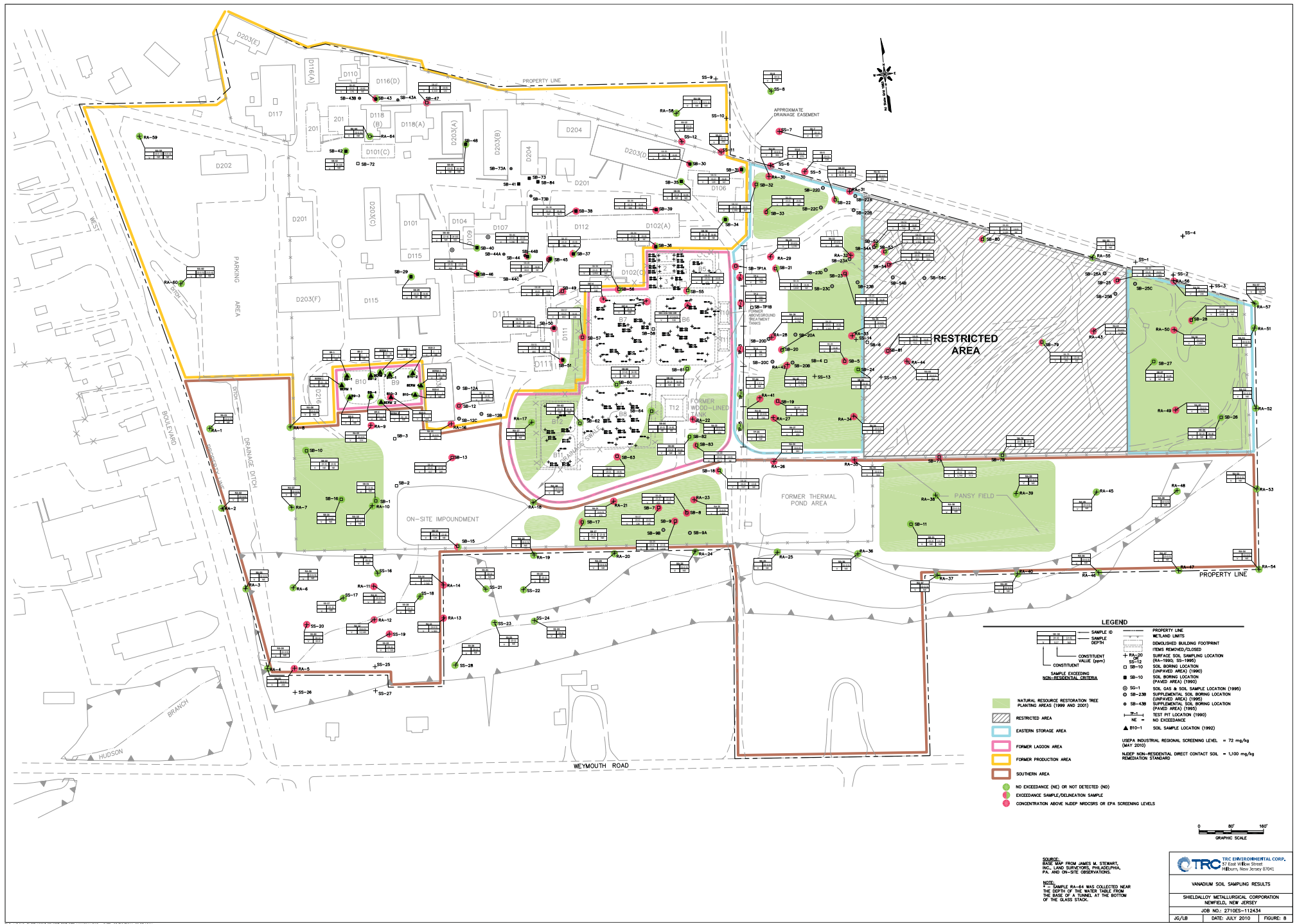
JG/LB

DATE: JANUARY 2011

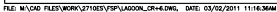
FIGURE: 1



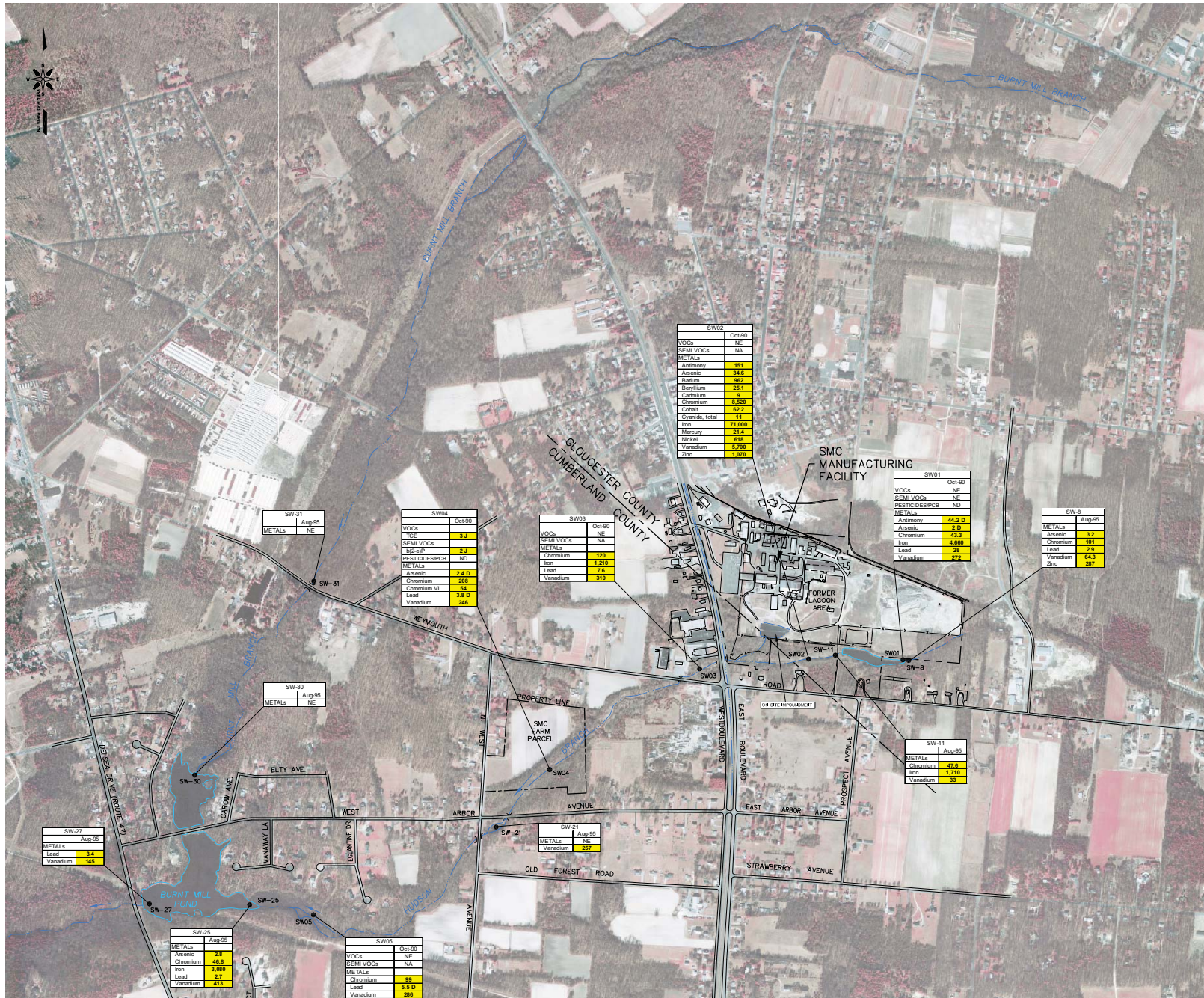




R2-0000340



R2-0000341



LEGEND	
---	PROPERTY LINE
SW-31 ●	SURFACE SAMPLE LOCATION
NE	NO EXCEEDANCE
NA	NOT ANALYZED
N/A	NO CRITERIA AVAILABLE
J	ESTIMATED VALUE
D	DETECTED BELOW THE QUANTITATION LIMIT AND ABOVE THE DETECTION LIMIT

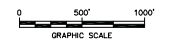
SAMPLE ID	
SW05	Oct-90
VOCS	NE
SEMI VOCS	NA
METALS	95
Chromium	5.5 D
Lead	255
Vanadium	255

CONCENTRATION IN PARTS PER BILLION (PPB)	PARAMETER
95	Chromium
5.5 D	Lead
255	Vanadium

PARAMETER	NJDEP Ecological Screening Criteria		USEPA NREOC **	
	Units	(µg/L)	Units	(µg/L)
VOCS		47	1	NA
Trichloroethylene (TCE)		50	1.5	NA
SEMI VOCS		50	1.5	NA
Pesticides/Herbicides		50	1.5	NA
METALS		50	1.5	NA
Antimony		150	0.017	150
Barium		250	2,000	NA
Bismuth		50	5	NA
Cadmium		0.05	0.4	0.25
Chromium		40	50	74
Chromium VI		50	0.24	11
Cobalt		50	0.24	11
Cyanide, total		50	150	5.2
Iron		1,000	100	1,000
Lead		0.07	0.05	0.77
Manganese		100	100	100
Mercury		10	0.01	10
Nickel		100	100	100
Vanadium		100	100	100
Zinc		100	100	100

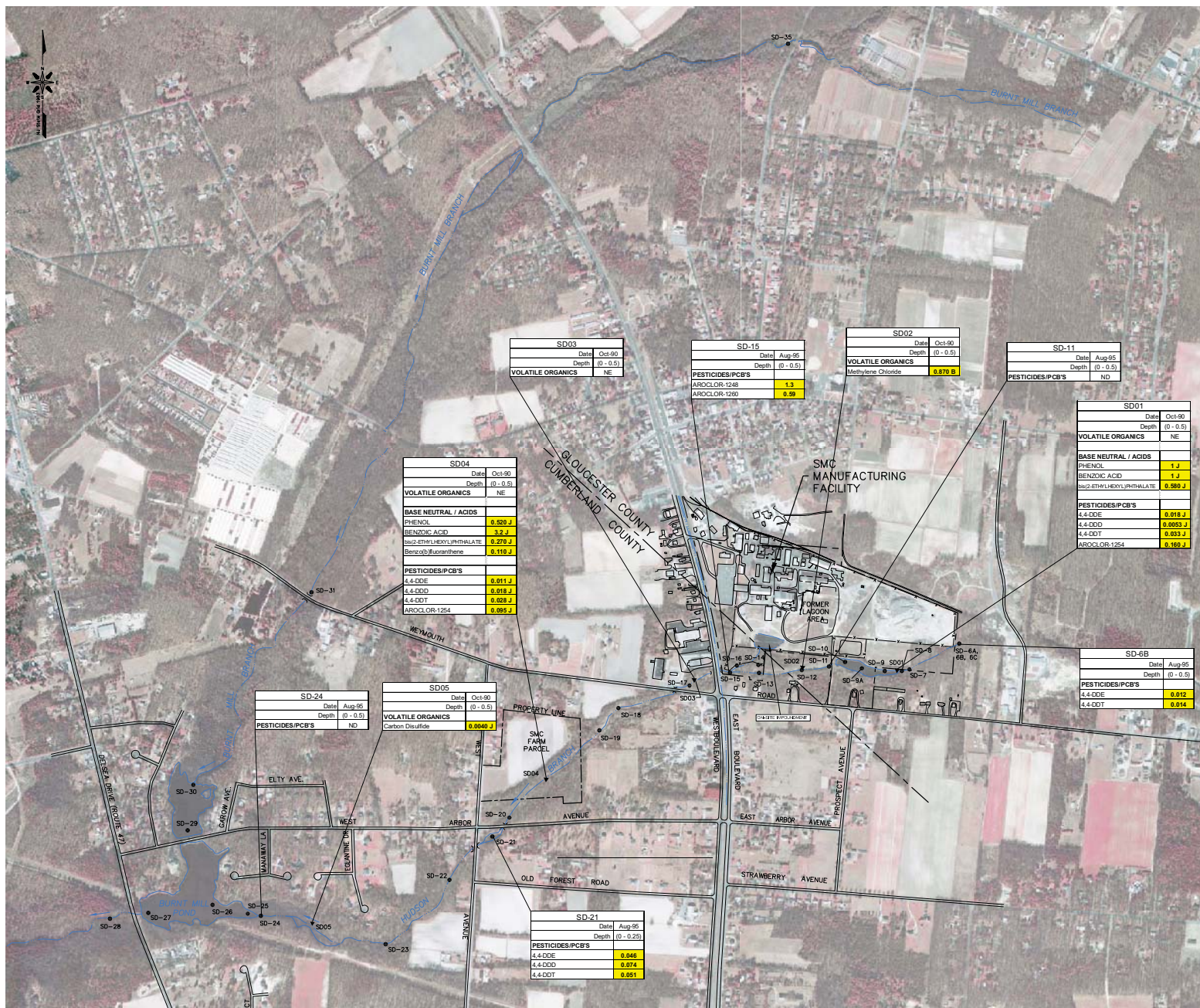
* NJDEP ECOLOGICAL SCREENING CRITERIA, FRESHWATER CRITERIA, MARCH 2009
 ** EPA NATIONAL RECOMMENDED WATER QUALITY CRITERIA, 2009
 NA = NOT ANALYZED
 CONCENTRATIONS ARE REPORTED IN PARTS PER BILLION (PPB) OR MICROGRAMS PER LITER (µg/L)

SOURCE: BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA. AND ON-SITE OBSERVATIONS.
 LAKESIDE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF VINELAND, OCTOBER 1, 1971.
 ORTHOPHOTOS FROM NEW JERSEY IMAGE WAREHOUSE WEB SITE, PUBLISHED 7/31/2003 WITH PHOTO TAKEN IN 2002.



TRC ENVIRONMENTAL CORP.	
57 East Willow Street Millbury, New Jersey 07041	
SURFACE WATER RESULTS	
SHELDALLOY METALLURGICAL CORPORATION NEWFIELD, NEW JERSEY	
JOB NO.: 2710ES-112434-00SEDI-002005	
JG/LB	DATE: JANUARY 2011
FIGURE: 11	

R2-0000343



LEGEND

--- PROPERTY LINE

SD-6A ● SEDIMENT SAMPLE LOCATION

ND - NOT DETECTED

NE - NO EXCEEDANCE

J - ESTIMATED VALUE

SD-6B		SAMPLE ID
Date	Aug-95	
Depth	(0 - 0.5)	
PESTICIDES/PCB'S		
4,4-DDD	0.012	CONCENTRATION IN PARTS PER MILLION (PPM)
4,4-DDT	0.014	
		PARAMETER

	EPA Region II BTAG*	NJDEP Ecological Screening Criteria**
VOLATILE ORGANICS (ppm)		
METHYLENE CHLORIDE	N/A	0.159
CARBON DISULFIDE	0.00851	N/A
TRICHLOROETHENE	0.0089	0.112
BASE NEUTRAL / ACIDS (ppm)		
PHENOL	0.42	0.0491
BENZOIC ACID	0.65	N/A
4,4-DDT	0.19	0.182
4,4-DDD	0.0272	10.4
PESTICIDES/PCB'S (ppm)		
4,4-DDD	0.00316	0.005
4,4-DDT	0.00488	0.008
4,4-DDT	0.00416	0.007
4,4-DDT	0.0098 (a)	0.03
4,4-DDT	0.0098 (a)	0.06
4,4-DDT	0.0098 (a)	0.005

* EPA Region II BTAG Freshwater Sediment Screening Benchmarks, August 2006.

** NJDEP Ecological Screening Criteria, Sediment, Freshwater Criteria, Lowest Effects Levels (S.E.L.), March 2005.

NE - Concentration above the NJDEP Screening Criteria and/or EPA Screening Benchmark.

All concentrations reported in parts per million (ppm) or milligrams per kilogram (mg/kg).

(a) Criteria for total PCB used.

N/A: Criteria Available.

SOURCE: BASE MAP FROM JAMES M. STEWART, INC., LAND SURVEYORS, PHILADELPHIA, PA. AND ON-SITE OBSERVATIONS.

LADROE PROPERTY BOUNDARY BASED ON TAX MAP-CITY OF WILMINGTON, OCTOBER 1, 1971.

ORTHOPHOTOS FROM NEW JERSEY IMAGE WAREHOUSE WEB SITE, PUBLISHED 7/31/2003 WITH PHOTO TAKEN IN 2002.

0 500' 1000'

GRAPHIC SCALE

TRC ENVIRONMENTAL CORP.	
57 East W. 10th Street	
Hightstown, New Jersey 08520	
ORGANICS SEDIMENT SAMPLE RESULTS	
SHELLDALLOY METALLURGICAL CORPORATION	
NEWFIELD, NEW JERSEY	
JOB NO: 2710ES-112434-005ED	
JG/LB	DATE: JANUARY 2011 FIGURE: 12

R2-0000344

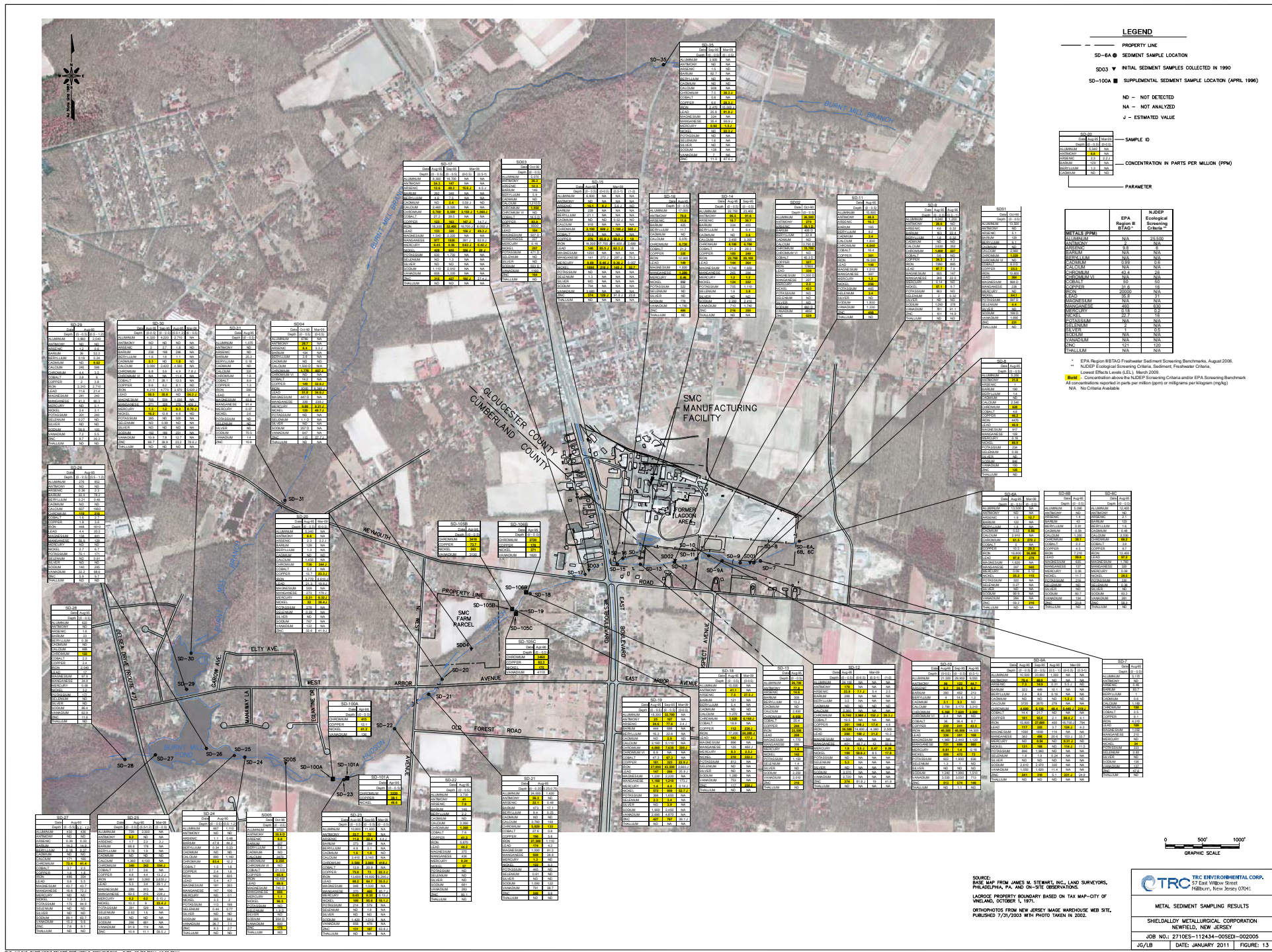
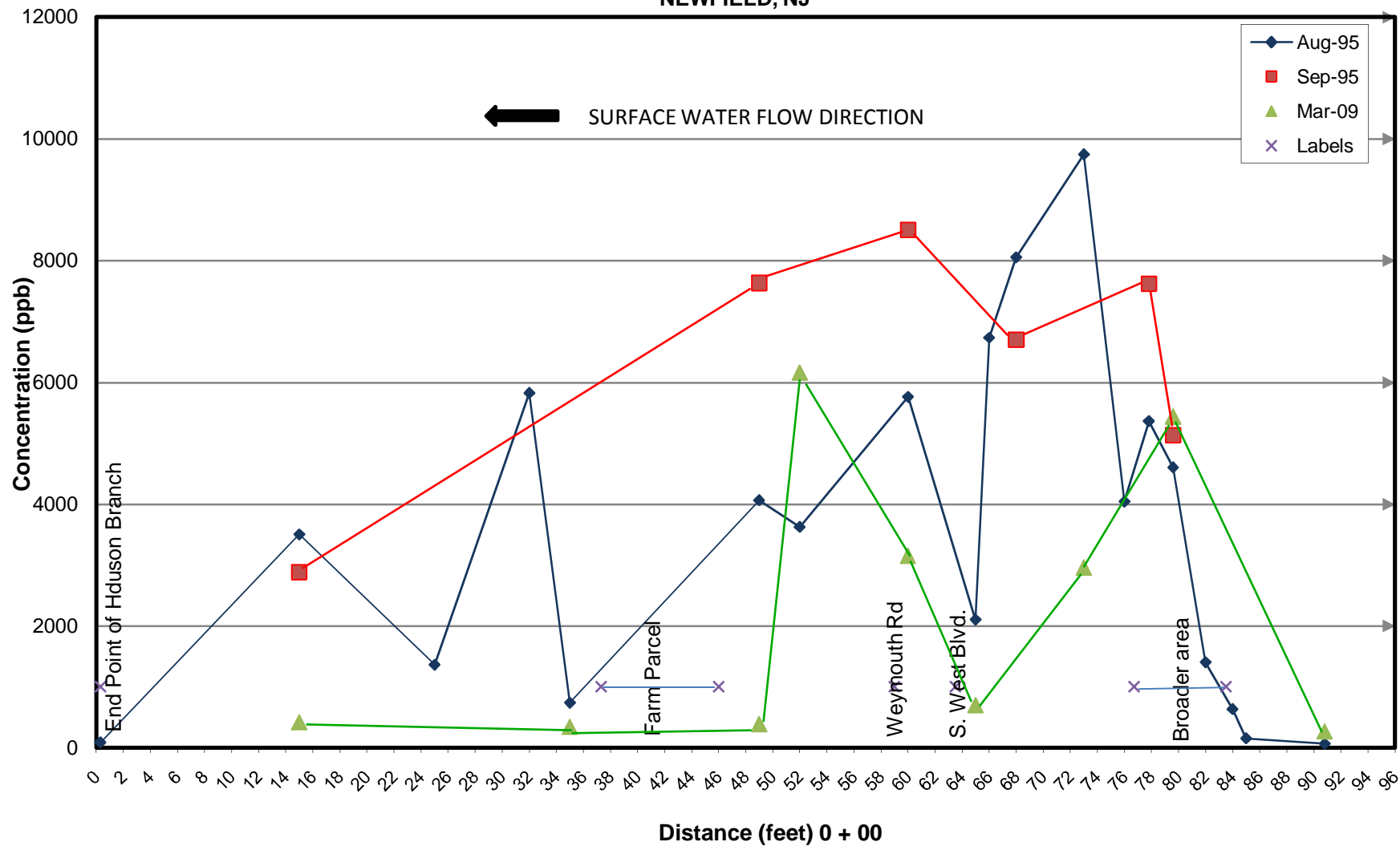


FIGURE 14
CHROMIUM CONCENTRATIONS IN SEDIMENTS ALONG HUDSON BRANCH
AUGUST AND SEPTEMBER 1995 AND MARCH 2009
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NJ



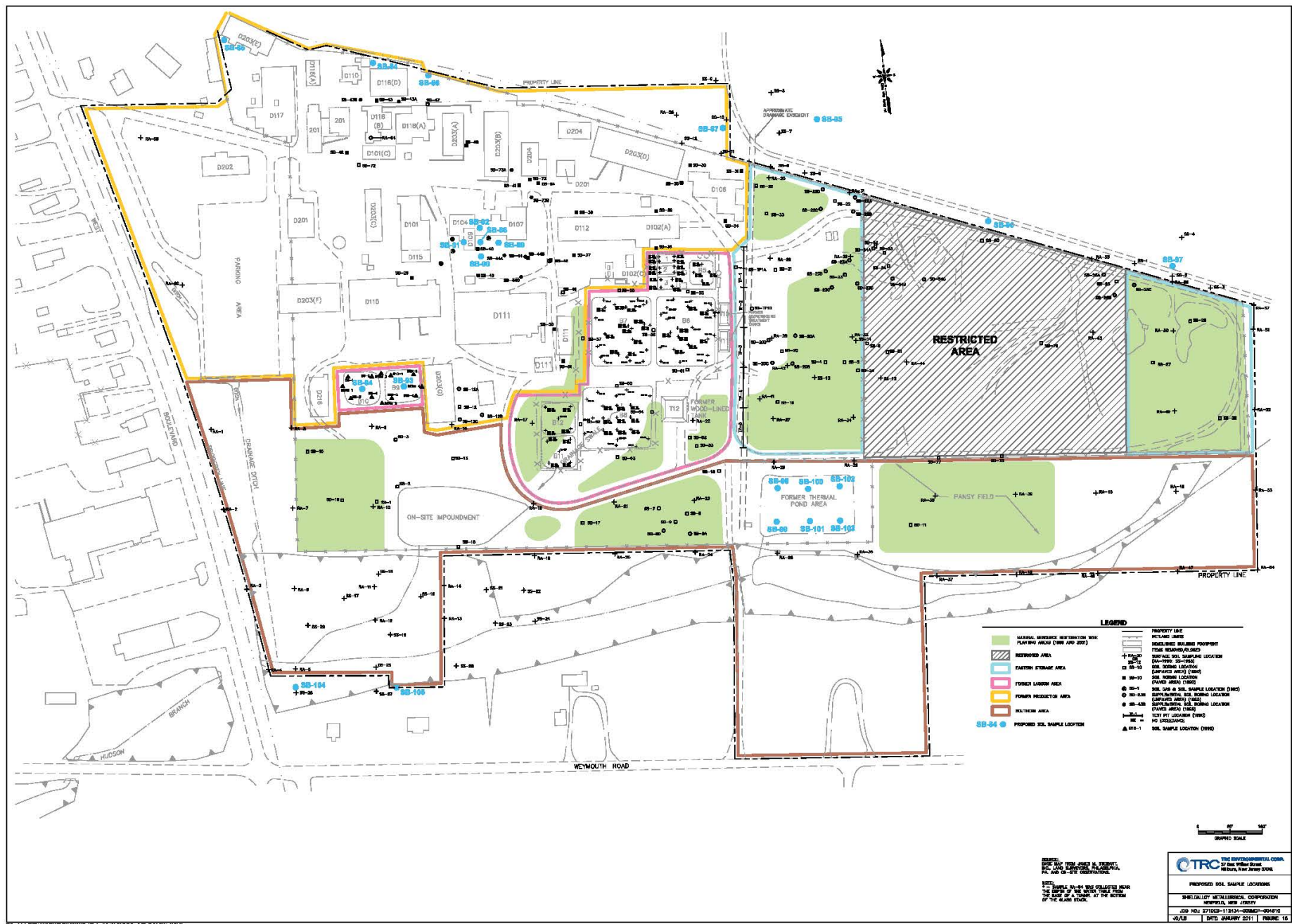
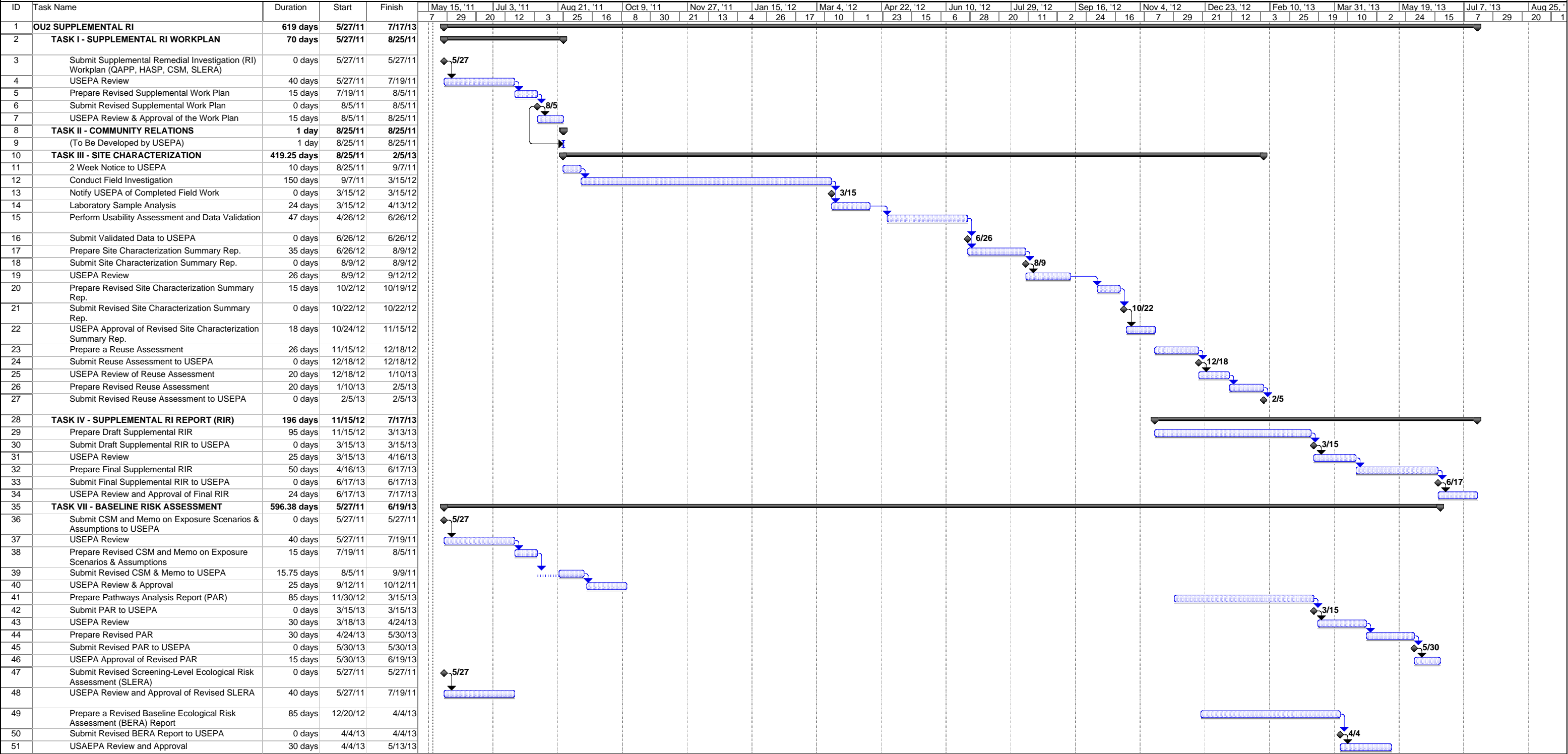


Figure 18. Project Schedule
Shieldalloy Metallurgical Corporation
Newfield, NJ



OU2 SUPPLEMENTAL RI/FS SCHED

Task



Progress



Summary



External Tasks



Deadline



Split



Milestone



Project Summary



External Milestone



TABLES

TABLE 1

Potential Federal and State Chemical-Specific ARARS and TBCs Criteria

FEDERAL
ARARS

TBCs

RCRA
 Subtitle C: Hazardous Waste and
 Implementing Regulations
 Subtitle D: Solid Waste and Implementing
 Regulations

Safe Drinking Water Act
 Including but not limited to Drinking
 Water Standards

Clean Water Act and its implementing
 regulations
 Surface Water Quality Criteria
 Surface Water Quality Standards
 NPDES Permit Program
 Section 404 Wetlands Program

Executive Order 11988, Floodplain
 Management

Executive Order 11990, Protection of
 Wetlands

EPA's 1985 Statement of Policy on
 Floodplains/Wetlands Assessments for
 CERCLA Actions

TSCA and its implementing regulations
 40CFR Part 761

40 CFR Part 6 Appendix A

Clean Air Act

Hazardous Materials Transportation Act

Endangered Species Act

National Historic Preservation Act

Guidance Documents on conducting RI/FS
 under CERCLA

CERCLA Guidance Documents on
 Presumptive Remedy for Municipal
 Landfills

CERCLA Guidance Documents on
 Conducting Risk Assessments

CERCLA Guidance Documents on Reusing
 Cleaned Up Superfund Sites

CERCLA Soil Screening Guidance

USEPA Ecological Soil Screening Levels
 for Industrial Soil (May 2010)

USEPA Freshwater Sediment Screening
 Benchmarks (Region III BTAG, August
 2006)

USEPA Contract Laboratory Program

TABLE 1

Potential Federal and State Chemical-Specific ARARS and TBCs Criteria

NEW JERSEY

ARARs

New Jersey Solid Waste Act and implementing regulations

New Jersey Safe Drinking Water Act and implementing regulations, including but not limited to the New Jersey Drinking Water Standards

NJAC 7:26E Technical Requirements for Site Remediation

NJAC 7:9C Ground Water Quality Standards

NJAC 7:9B Surface Water Quality Standards

NJAC 2:90 Soil Erosion and Sediment Control Plan Certification

New Jersey Flood Area Hazard Control Act and its implementing regulations

New Jersey Freshwater Wetlands Protection Act and implementing regulations, NJAC 7:7A

NJAC 7:9D Well Construction and Drilling Permits

NJAC 7:18 Laboratory Certification Regulations

TBCs

NJDEP Field Sampling Procedures Manual

Soil Remediation Standards (Non-Residential)

NJDEP Guidance for Sediment Quality Evaluation

TABLE 2 NUMBER OF SOIL SAMPLES COLLECTED BY AREA		
AREAS	SOIL SAMPLES	SOIL SAMPLES ABOVE CRITERIA (1)
Former Production Area		
VOCs	34	0
Semi-VOCs	28	0
Pesticides/PCBs	23	0
Metals	62	2
Cr+6	28	3
Vanadium	55	25
Former Lagoon Areas		
VOCs	4	0
Semi-VOCs	2	0
Pesticides/PCBs	2	0
Metals	30	0
Cr+6	78	18
Vanadium	21	7
Eastern Storage Areas		
VOCs	13	0
Semi-VOCs	9	0
Pesticides/PCBs	29	1
Metals	47	0
Cr+6	42	1
Vanadium	42	26
Southern Area		
VOCs	5	0
Semi-VOCs	5	0
Pesticides/PCBs	3	0
Metals	62	0
Cr+6	62	0
Vanadium	62	23

NOTES:

(1) - Soil samples exceeding the EPA Screening Industrial Soil Level (2010) and/or the NJDEP Non-Residential Direct Contact Soil Remediation Standards (NRDCSRS).

TABLE 3 NUMBER OF SURFACE WATER SAMPLES COLLECTED BY AREA		
AREAS	SURFACE WATER SAMPLES	SURFACE WATER SAMPLES ABOVE EPA (1) and NJDEP WATER CRITERIA (2)
Hudson Branch		
VOCs	5	1
Semi-VOCs	2	1
Pesticides/PCBs	2	0
Metals	8	8
Burnt Mill Pond		
VOCs	0	0
Semi-VOCs	0	0
Pesticides/PCBs	0	0
Metals	2	2
Burnt Mill Branch		
VOCs	0	0
Semi-VOCs	0	0
Pesticides/PCBs	0	0
Metals	2	0

NOTES:

(1) - National Recommended Water Quality Criteria (2009)

(2) - NJDEP Surface Water Quality Criteria (SWQC) for Freshwater FW2-classified waters (2009)

TABLE 4 NUMBER OF SEDIMENT SAMPLES COLLECTED BY AREA		
		SEDIMENT SAMPLES
		ABOVE EPA SCREENING (1) and NJDEP SCREENING CRITERIA (2)
AREAS	SEDIMENT SAMPLES	
Hudson Branch		
VOCs	5	2
Semi-VOCs	2	2
Pesticides	7	4
PCBs	7	3
Metals	54	53
Burnt Mill Pond		
VOCs	0	0
Semi-VOCs	0	0
Pesticides/PCBs	0	0
Metals	9	8
Burnt Mill Branch		
VOCs	0	0
Semi-VOCs	0	0
Pesticides/PCBs	0	0
Metals	8	7

NOTES:

(1) - EPA Freshwater Sediment Screening Benchmarks (Region III BTAG, August 2006)

(2) - NJDEP Ecological Screening Criteria (March 2009)

Table 5
Proposed Soil Samples
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Sample ID	Depth Interval (ft)	Analytical Protocols	Sample Collection Protocol	Minimum # of Samples	Maximum # of Samples	Comment
FORMER PRODUCTION AREA						
SB-84	0 - 0.5	Vanadium, pH	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-85	0 - 0.5	Vanadium, pH	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-86	0 - 0.5	Vanadium, pH	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-87	0 - 0.5	Vanadium, pH	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-88	SEE FLOW DIAGRAM A-2	TCL VOC	SEE FLOW DIAGRAM A-2 Collect soil sample for analysis from the 0.5 ft interval with highest PID/FID reading or greatest impact (i.e., staining, sheens). If evidence of contamination is encountered, then collect a contingency sample 2 to 3 feet below the first sample. If no evidence of contamination, collect sample from the 0.5 ft interval above the water table. If the contingency results are above the USEPA or NJDEP guidance, then the field team will be directed to step out and advance a second boring to accomplish delineation.	1	2	Subsurface Soil Sample
SB-89	SEE FLOW DIAGRAM A-2	TCL VOC	SEE FLOW DIAGRAM A-2 Collect soil sample for analysis from the 0.5 ft interval with highest PID/FID reading or greatest impact (i.e., staining, sheens). If evidence of contamination is encountered, then collect a contingency sample 2 to 3 feet below the first sample. If no evidence of contamination, collect sample from the 0.5 ft interval above the water table. If the contingency results are above the USEPA or NJDEP guidance, then the field team will be directed to step out and advance a second boring to accomplish delineation.	1	2	Subsurface Soil Sample

Table 5
Proposed Soil Samples
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Sample ID	Depth Interval (ft)	Analytical Protocols	Sample Collection Protocol	Minimum # of Samples	Maximum # of Samples	Comment
SB-90	SEE FLOW DIAGRAM A-2	TCL VOC	SEE FLOW DIAGRAM A-2 Collect soil sample for analysis from the 0.5 ft interval with highest PID/FID reading or greatest impact (i.e., staining, sheens). If evidence of contamination is encountered, then collect a contingency sample 2 to 3 feet below the first sample. If no evidence of contamination, collect sample from the 0.5 ft interval above the water table. If the contingency results are above the USEPA or NJDEP guidance, then the field team will be directed to step out and advance a second boring to accomplish delineation.	1	2	Subsurface Soil Sample
SB-91	SEE FLOW DIAGRAM A-2	TCL VOC	SEE FLOW DIAGRAM A-2 Collect soil sample for analysis from the 0.5 ft interval with highest PID/FID reading or greatest impact (i.e., staining, sheens). If evidence of contamination is encountered, then collect a contingency sample 2 to 3 feet below the first sample. If no evidence of contamination, collect sample from the 0.5 ft interval above the water table. If the contingency results are above the USEPA or NJDEP guidance, then the field team will be directed to step out and advance a second boring to accomplish delineation.	1	2	Subsurface Soil Sample
SB-92	SEE FLOW DIAGRAM A-2	TCL VOC	SEE FLOW DIAGRAM A-2 Collect soil sample for analysis from the 0.5 ft interval with highest PID/FID reading or greatest impact (i.e., staining, sheens). If evidence of contamination is encountered, then collect a contingency sample 2 to 3 feet below the first sample. If no evidence of contamination, collect sample from the 0.5 ft interval above the water table. If the contingency results are above the USEPA or NJDEP guidance, then the field team will be directed to step out and advance a second boring to accomplish delineation.	1	2	Subsurface Soil Sample
FORMER LAGOONS AREA						
SB-93A	0 - 0.5	TCL VOC, total Cr, Cr+6, Vanadium, pH, ORP	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. Soil sample for VOC analysis will be collected from 0.5 to 1 foot below ground. Surface soil samples will be collected to confirm previous post lagoon closure samples results.	1	2	Surface Soil
SB-94A	0 - 0.5	TCL VOC, total Cr, Cr+6, Vanadium, pH, ORP	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. Soil sample for VOC analysis will be collected from 0.5 to 1 foot below ground. Surface soil samples will be collected to confirm previous post lagoon closure samples results.	1	2	Surface Soil

Table 5
Proposed Soil Samples
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Sample ID	Depth Interval (ft)	Analytical Protocols	Sample Collection Protocol	Minimum # of Samples	Maximum # of Samples	Comment
SB-93B	SEE FLOW DIAGRAM A-2	TCL VOC, Cr+6, Vanadium, pH, ORP	SEE FLOW DIAGRAM A-2 Subsurface soil sample for analysis will be collected from the 0.5 ft interval with highest PID/FID reading or greatest impact (i.e staining, sheens). If evidence of contamination is encountered, then collect a contingency sample 2 to 3 feet below the first sample. If no evidence of contamination, collect sample from the 0.5 ft interval above the water table. If the contingency results are above the EPA or NJDEP guidance, then the field team will be directed to step out and advance a second boring to accomplish delineation.	1	2	Subsurface Soil Sample
SB-94B	SEE FLOW DIAGRAM A-2	TCL VOC, Cr+6, Vanadium, pH, ORP	SEE FLOW DIAGRAM A-2 Subsurface soil sample for analysis will be collected from the 0.5 ft interval with highest PID/FID reading or greatest impact (i.e staining, sheens). If evidence of contamination is encountered, then collect a contingency sample 2 to 3 feet below the first sample. If no evidence of contamination, collect sample from the 0.5 ft interval above the water table. If the contingency results are above the EPA or NJDEP guidance, then the field team will be directed to step out and advance a second boring to accomplish delineation.	1	2	Subsurface Soil Sample
EASTERN STORAGE AREAS						
SB-95	0 - 0.5	Cr+6, Vanadium, pH, ORP	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-96	0 - 0.5	Vanadium, pH	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-97	0 - 0.5	Vanadium, pH	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample

Table 5
Proposed Soil Samples
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Sample ID	Depth Interval (ft)	Analytical Protocols	Sample Collection Protocol	Minimum # of Samples	Maximum # of Samples	Comment
SOUTHERN AREA						
SB-98	0 - 0.5	TCL VOC, TAL Metals, Cr+6, pH, ORP	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. Soil samples for VOC analysis will be collected from 0.5 to 1 foot below surface. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-99	0 - 0.5	TCL VOC, TAL Metals, Cr+6, pH, ORP	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. Soil samples for VOC analysis will be collected from 0.5 to 1 foot below surface. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-100	0 - 0.5	TCL VOC, TAL Metals, Cr+6, pH, ORP	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. Soil samples for VOC analysis will be collected from 0.5 to 1 foot below surface. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-101	0 - 0.5	TCL VOC, TAL Metals, Cr+6, pH, ORP	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. Soil samples for VOC analysis will be collected from 0.5 to 1 foot below surface. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-102	0 - 0.5	TCL VOC, TAL Metals, Cr+6, pH, ORP	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. Soil samples for VOC analysis will be collected from 0.5 to 1 foot below surface. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample

Table 5
Proposed Soil Samples
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Sample ID	Depth Interval (ft)	Analytical Protocols	Sample Collection Protocol	Minimum # of Samples	Maximum # of Samples	Comment
SB-103	0 - 0.5	TCL VOC, TAL Metals, Cr+6, pH, ORP	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. Soil samples for VOC analysis will be collected from 0.5 to 1 foot below surface. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-104	0 - 0.5	Vanadium, pH	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
SB-105	0 - 0.5	Vanadium, pH	SEE FLOW DIAGRAM A-1 Collect soil sample from the 0.5 ft interval below surface. If lab results are above the USEPA or NJDEP guidance, then TRC and USEPA may determine if additional sampling is required.	1	2	Surface Soil Sample
BACKGROUND SOIL SAMPLES						
BG-1	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-2	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-3	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-4	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-5	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-6	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-7	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-8	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-9	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample

Table 5
Proposed Soil Samples
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Sample ID	Depth Interval (ft)	Analytical Protocols	Sample Collection Protocol	Minimum # of Samples	Maximum # of Samples	Comment
BG-10	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-11	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-12	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample
BG-13	0 - 0.5	TAL Metals, Cr+6, pH, ORP	Collect soil sample from the 0.5 ft interval below surface. If pavement is present in the area, collect sample within 0.5 ft below the pavement area.	1	1	Surface Soil Sample

TABLE 6
MASTER SAMPLING AND ANALYSIS SUMMARY
 Shieldalloy Metallurgical Corporation
 Newfield, New Jersey

Matrix	Analysis	Number of Samples ^a	Field Duplicates	Trip Blanks	Field Equipment Blanks	Sample Container ^b & Size	Preservation	Holding Time	Analytical Method
SOIL (Subsurface Soil)	TCL VOC	7	1	0	0	Encore [®] sampler	Sealed in Encore [®] Bag, cool to 4°C	48 hours to extract 14 days to analyze	USEPA –SW8260B
SOIL (Surface Soil)	TCL VOC	8	1	0	0	Encore [®] sampler	Sealed in Encore [®] Bag, cool to 4°C	48 hours to extract 14 days to analyze	USEPA –SW8260B
SOIL (Subsurface Soil)	Vanadium	2	1	0	1/day	1 x 4 oz. glass	None	6 months	USEPA –6010C, 7471B
SOIL (Surface Soil)	Vanadium	11	1	0	1/day	1 x 4 oz. glass	None	6 months	USEPA –6010C, 7471B
SOIL (Surface Soil)	TAL Metals	19	1	0	1/day	1 x 4 oz. glass	None	6 months (Hg 28 days)	USEPA –6010C, 7471B
SOIL (Subsurface Soil)	Hexavalent Chromium	2	1	0	1/day	1 x 4 oz. glass	None	30 days (c)	USEPA –3060A, 7196A
SOIL (Surface Soil)	Hexavalent Chromium	22	2	0	1/day	1 x 4 oz. glass	None	30 days (c)	USEPA –3060A, 7196A
SOIL	pH	32	2	0	0	1 x 4 oz. glass	None	48 hours to analyze	SW-846 9045C, D
SOIL	ORP	24	1	0	0	1 x 4 oz. glass bottle	Cool, 4°C	48 hours to analysis	ASTM D1498-00

Matrix	Analysis	Number of Samples ^a	Field Duplicates	Trip Blanks	Field Equipment Blanks	Sample Container ^b & Size	Preservation	Holding Time	Analytical Method
SURFACE WATER	TCL VOC	19	1	1/shipment	1/day	3 x 40 ml vial	HCl to pH<2/Cool, 4 Deg. C	14 days to analyze	USEPA –SW8260B
	TAL Metals	21	2	0	1/day	1 x 500 ml	HNO ₃ , pH<2	6 months (Hg 28 days)	USEPA –6010C, 7470A, 6020A
	Hexavalent Chromium	21	2	0	1/day	1 x 500 ml	Cool to 4°C	24 hours	USEPA – 7196A
	Hardness	21	2	0	1/day	1 x 100 ml glass	HNO ₃ to pH<2 Cool to 4°C	6 months	USEPA – 130.2

TABLE 6
MASTER SAMPLING AND ANALYSIS SUMMARY
 Shieldalloy Metallurgical Corporation
 Newfield, New Jersey

Matrix	Analysis	Number of Samples ^a	Field Duplicates	Trip Blanks	Field Equipment Blanks	Sample Container ^b & Size	Preservation	Holding Time	Analytical Method
SEDIMENT/SOIL	TCL Semi-VOC	35	2	0	1/day	1 x 4 oz. glass	Cool to 4°C	14 days to extract 40 days to analyze	USEPA –SW8270C USEPA - SW8270D
	TCL PCBs	35	2	0	1/day	1 x 4 oz. glass	Cool to 4°C	14 days to extract 40 days to analyze	USEPA –SW8082A
	TCL Pesticides	35	2	0	1/day	1 x 4 oz. glass	Cool to 4°C	14 days to extract 40 days to analyze	USEPA –SW8081B
	TAL Metals	41	3	0	1/day	1 x 4 oz. glass	None	6 months (Hg 28 days)	USEPA –6010C, 7471B
	Hexavalent Chromium	14	1	0	1/day	1 x 4 oz. glass	None	30 days (c)	USEPA –3060A, 7196A
	Total Organic Carbon	27	2	0	0	1 x 4 oz. glass	Cool to 4°C	14 days	Lloyd Kahn
	Grain Size Distribution	27	2	0	0	1 x 8 oz. glass	None	None	ASTM D422-63
	pH	41	3	0	0	1 x 4 oz. glass	None	48 hours to analyze	SW-846 9045C, D
	ORP	14	1	0	0	1 x 4 oz. glass bottle	Cool, 4°C	48 hours to analysis	ASTM D1498-00

a Estimated minimum number. Additional samples may be collected for delineation. Actual number will depend on field conditions and analytical results.

b Some parameters may be analyzed from the same container used to sample soil, sediment or surface water.

c 30 days to digestion, 7 days to analysis.

**TABLE 7
PROPOSED SURFACE WATER AND SEDIMENT SAMPLES
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY**

STATION LOCATION		Sample IDs	Media	Analytical Protocols	Sample Depth (Feet) (SEE NOTE 1)	Sample Rationale
Hudson Branch						
1	Quiescent, Low Energy Area	SW-01	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	To assess stream quality within the Hudson Branch in the unnamed pond area at the location of previous surface water and sediment sample SW/SD-01
2	Transect, Mid-Channel Sediment	SD-01B	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
3	Transect, North Bank Soil	SD-01N	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
4	Transect, South Bank Soil	SD-01S	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
5	Quiescent, Low Energy Area	SW-10	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	To assess stream quality within the Hudson Branch in the unnamed pond area at the location of previous sediment sample SD-10
6	Transect, Mid-Channel Sediment	SD-10B	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
7	Transect, North Bank Soil	SD-10N	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
8	Transect, South Bank Soil	SD-10S	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
9	Quiescent, Low Energy Area	SW-13	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	To assess stream quality within the Hudson Branch downstream of unnamed pond at the location of previous sediment sample SD-13
10	Transect, Mid-Channel Sediment	SD-13B	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
11	Transect, North Bank Soil	SD-13N	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
12	Transect, South Bank Soil	SD-13S	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
13	Quiescent, Low Energy Area	SW-15	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	To assess stream quality within the Hudson Branch near the southwest corner of the property at the location of previous sediment sample SD-15
14	Transect, Mid-Channel Sediment	SD-15B	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
15	Transect, North Bank Soil	SD-15N	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
16	Transect, South Bank Soil	SD-15S	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
17	Quiescent, Low Energy Area	SW-18	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	To assess stream quality within the Hudson Branch downstream of car wash area at the location of previous sediment sample SD-18
18	Transect, Mid-Channel Sediment	SD-18B	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
19	Transect, North Bank Soil	SD-18N	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
20	Transect, South Bank Soil	SD-18S	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
21	Quiescent, Low Energy Area	SW-04	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	To assess stream quality within the Hudson Branch at the Former Parcel at the location of previous surface water and sediment sample SW/SD-04
22	Transect, Mid-Channel Sediment	SD-04B	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
23	Transect, North Bank Soil	SD-04N	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
24	Transect, South Bank Soil	SD-04S	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
25	Quiescent, Low Energy Area	SW-23	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	To assess stream quality within the Hudson Branch downstream of the Former Parcel at the location of previous sediment sample SD-23
26	Transect, Mid-Channel Sediment	SD-23B	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
27	Transect, North Bank Soil	SD-23N	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
28	Transect, South Bank Soil	SD-23S	Soil	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, Cr+6, pH, ORP	0 - 0.5 BGS	
29	Pond, Depositional Area	SD-IMP1A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	To assess sediment quality within the on-site impoundment
30	Pond, Depositional Area	SD-IMP2A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	
31	Pond, Depositional Area	SD-IMP3A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	
32	Pond, Depositional Area	SD-IMP4A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	
33	Pond, Depositional Area	SD-IMP5A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	
34	Pond, Depositional Area	SD-IMP6A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	
Burnt Mill Pond						
35	Quiescent, Low Energy Area	SW-25	Surface Water	TAL Metals, Cr+6, Hardness, FP, VOCs*	0.5 BAWI	To assess stream quality within the Burnt Mill Pond, at the location of previous surface water and sediment sample SW/SD-25
36	Pond, Depositional Area	SD-25B	Sediment	TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
37	Quiescent, Low Energy Area	SW-26	Surface Water	TAL Metals, Cr+6, Hardness, FP, VOCs*	0.5 BAWI	To assess stream quality within the Burnt Mill Pond, at the location of previous sediment sample SD-26
38	Pond, Depositional Area	SD-26B	Sediment	TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
39	Quiescent, Low Energy Area	SW-27	Surface Water	TAL Metals, Cr+6, Hardness, FP, VOCs*	0.5 BAWI	To assess stream quality within the Burnt Mill Pond, at the location of previous sediment sample SD-27
40	Pond, Depositional Area	SD-27B	Sediment	TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
41	Quiescent, Low Energy Area	SW-29	Surface Water	TAL Metals, Cr+6, Hardness, FP, VOCs*	0.5 BAWI	To assess stream quality within the Burnt Mill Pond, at the location of previous sediment sample SD-29
42	Pond, Depositional Area	SD-29B	Sediment	TAL Metals, TOC, PGS, pH	1.5 - 2 BWSI	
Burnt Mill Branch						
43	Quiescent, Low Energy Area	SW-28	Surface Water	TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	To assess stream quality within the Burnt Mill Branch, downstream of Burnt Mill Pond at the location of previous sample SD-28
44	Transect, Mid-Channel Sediment	SD-28A	Sediment	TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	
45	Quiescent, Low Energy Area	SW-38	Surface Water	TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	To assess stream quality within the Burnt Mill Branch, downstream of Burnt Mill Pond and previous sample SD-28
46	Transect, Mid-Channel Sediment	SD-38A	Sediment	TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	

TABLE 7
PROPOSED SURFACE WATER AND SEDIMENT SAMPLES
SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

STATION LOCATION	Sample IDs	Media	Analytical Protocols	Sample Depth (Feet) (SEE NOTE 1)	Sample Rationale
Burnt Mill Branch (Background Locations)					
47 Quiescent, Low Energy Area	SW-30	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	<i>To assess background conditions within the Burnt Mill Branch,</i>
48 Transect, Mid-Channel Sediment	SD-30A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	<i>at previous sediment sample SD-30</i>
49 Quiescent, Low Energy Area	SW-31	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	<i>To assess background conditions within the Burnt Mill Branch,</i>
50 Transect, Mid-Channel Sediment	SD-31A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	<i>at previous sediment sample SD-31</i>
51 Quiescent, Low Energy Area	SW-32	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	<i>To assess background conditions within the Burnt Mill Branch,</i>
52 Transect, Mid-Channel Sediment	SD-32A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	<i>upstream of sediment sample SD-31</i>
53 Quiescent, Low Energy Area	SW-33	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	<i>To assess background conditions within the Burnt Mill Branch,</i>
54 Transect, Mid-Channel Sediment	SD-33A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	<i>between Columbia Ave. and West Blvd.</i>
55 Quiescent, Low Energy Area	SW-34	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	<i>To assess background conditions within the Burnt Mill Branch,</i>
56 Transect, Mid-Channel Sediment	SD-34A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	<i>at intersection with West Blvd.</i>
57 Quiescent, Low Energy Area	SW-35	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	<i>To assess background conditions within the Burnt Mill Branch,</i>
58 Transect, Mid-Channel Sediment	SD-35A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	<i>at previous sediment sample SD-35</i>
59 Quiescent, Low Energy Area	SW-36	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	<i>To assess background conditions within the Burnt Mill Branch,</i>
60 Transect, Mid-Channel Sediment	SD-36A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	<i>at intersection with Madison Ave.</i>
61 Quiescent, Low Energy Area	SW-37	Surface Water	TCL VOCs, TAL Metals, Cr+6, Hardness, FP	0.5 BAWI	<i>To assess background conditions within the Burnt Mill Branch,</i>
62 Transect, Mid-Channel Sediment	SD-37A	Sediment	TCL Semi-VOCs and pesticides/PCBs, TAL Metals, TOC, PGS, pH	0 - 0.5 BWSI	<i>Upstream location</i>

Notes:

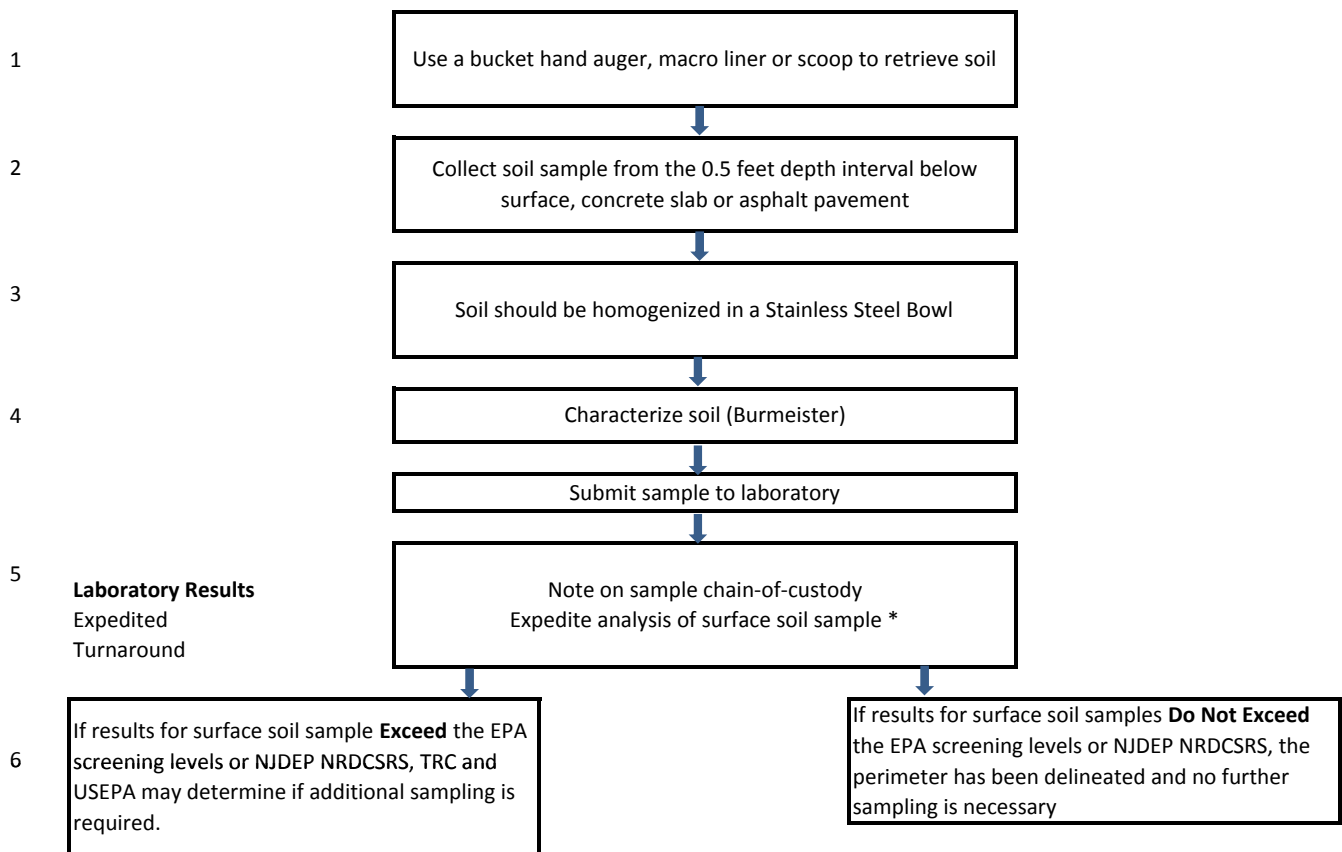
- 1) For Surface Water, sample collection will be 0.5 feet below air-water interface **(BAWI)**.
- 2) For Sediment, sample collection depth intervals will be 0 - 0.5 feet or 1.5 - 2.0 feet below water-sediment interface **(BWSI)**.
- 3) For Soil, sample collection depth interval will be 0 - 0.5 feet below ground surface **(BGS)**
- 4) Photographs and physical measurements will be collected from each sample location including stream channel width and depth, and stream flow rate
- 5) QA Samples will include one duplicate per 20 samples and One field blank (from sampling equipment) per day of sampling
 - TCL+30** = TCL VO+10 (via USEPA Method 8260B) and TCL Semi-VOCs+20 (via USEPA Method 8270D);
 - Pest/PCBs** = TCL Pesticides and TCL PCBs (via USEPA Method 8081A and 8082A, respectively);
 - TAL** = TAL Metals (via USEPA Method 6010B, 6020A, 7471A) - **Total (unfiltered) and dissolved (filtered)**;
 - Hexavalent chromium** = (via USEPA Method 7196A);
 - FP:** Field Parameters include Dissolved Oxygen [DO], pH, eH (REDOX potential), specific conductance, temperature, turbidity and salinity .
 - PGS** = Particle Grain Size Distribution (via ASTM Method D422-63)

* Contingency VOC surface water samples will be collected from the Mill Burnt Pond. VOC analysis will be conducted if VOCs are detected in the Hudson Branch

APPENDIX A

SOIL SAMPLING PROTOCOLS – FLOW DIAGRAMS

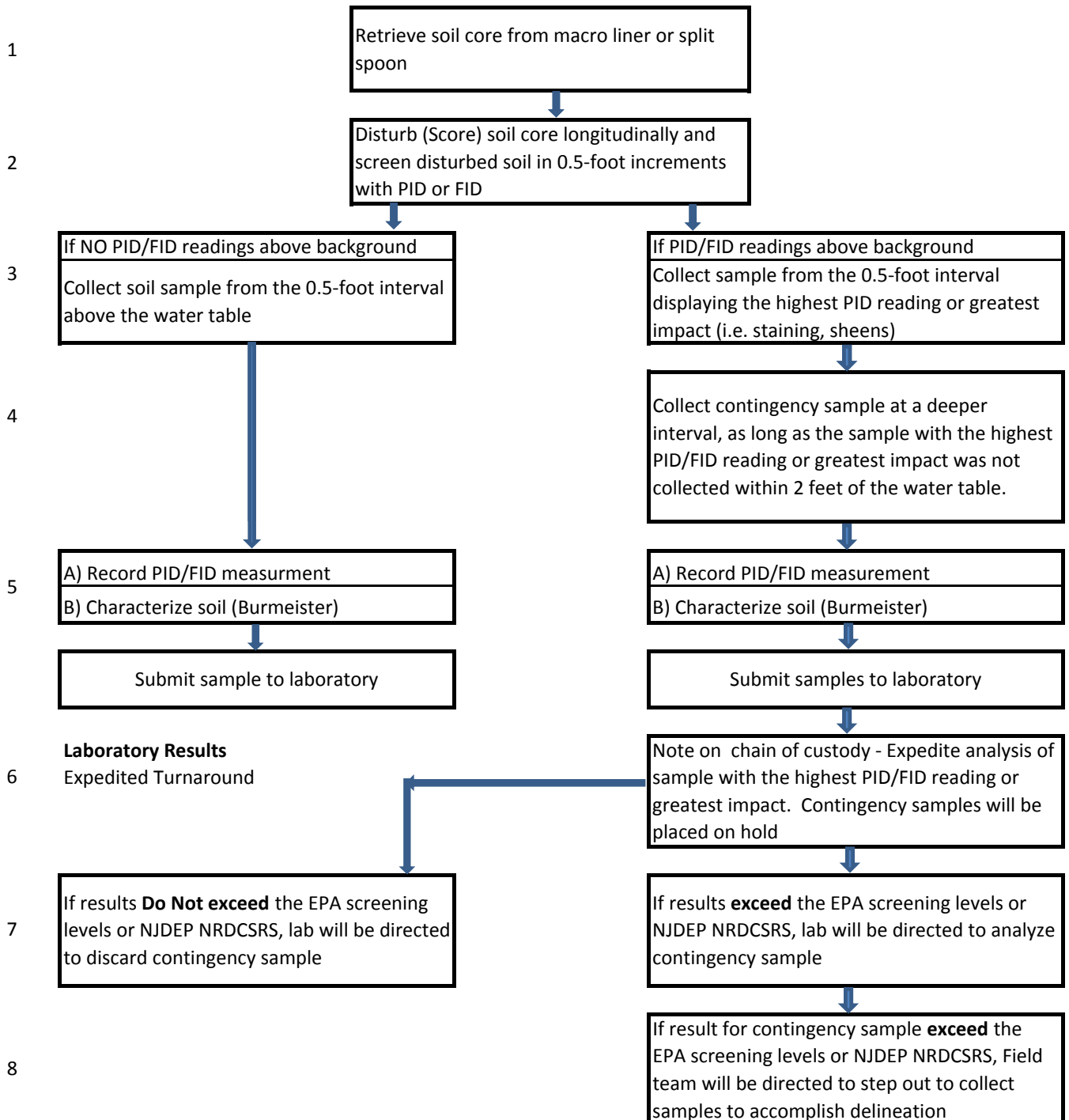
Flow Diagram A-1
Surface Soil Sampling Protocol
Shieldalloy Metallurgical Corporation
Newfield, New Jersey



* Surface soil samples from Former Basin B9 and B10 and the Former Thermal Pond Area will be analyzed on a normal turnaround time.

Flow Diagram A-2
Subsurface Soil Sampling Protocol
Unsaturated Zone Investigation
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Sample Collection From
Depth Intervals: **Continuous soil samples to the water table**



Flow Diagram A-3
Sediment/Soil Sampling Protocol
Shieldalloy Metallurgical Corporation
Newfield, New Jersey

Sediment/Soil Sample Collection From
Pre-Determined Depth Intervals: **0 - 0.5 ft or 1.5 - 2 ft**

